

THE AMERICAN JOURNAL OF PHARMACY.

FEBRUARY, 1884.

MEDICATED WATERS.

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Read at the Pharmaceutical Meeting, January 15, 1884.

The term "Medicated Waters" is applied in a general sense to all those aqueous liquids holding in solution the volatile oils of plants, or in some cases the stearopten of a volatile oil e. g. Aqua camphoræ. This definition is only partially adhered to by the Pharmacopœia which also admits under the same heading, aqueous solutions of certain odorous gases and liquids not directly derived from plant life. Through misplacement, therefore, Aqua ammoniæ, Aqua ammoniæ fortior, Aqua chlori and Aqua creasoti have been classified among the officinal waters, the position of which, it is thought, from their composition should have been among the "Liquors." The present paper will deal only with the waters first named; that is those derived from volatile oils; and will have for its scope the various methods of preparations employed, explanations of the several advantages and disadvantages peculiar to each; while a substitutive process will be offered and the principles involved in the workings of the same set forth.

The U. S. Pharmacopœia of 1870, in the formulæ for these waters, gave in all cases, either one or the alternative of two processes. First: Distillation of the odorous part of the plant with water, after previous comminution and maceration if necessary; or, second: Trituration of the volatile oil of the plant with magnesium carbonate, the addition of distilled water and filtration.

During the process of "distillation" the water carries over with it in suspension the vapor of the oily product used and both are condensed in the receiver in separate layers. The oily portion is separated by suitable apparatus, leaving the water impregnated with its taste and fragrance. The fragrance is at first masked with a foreign odor that gradually disappears on exposure to air; leaving the true one, partially modified to one of finer quality, through the supposed presence of certain volatile acids and compound or mixed ethers. Distillation while admittedly the best in comparison with the present methods

pursued, is to a great extent in the limited uses of most pharmacists impracticable for general employment. It requires for its successful exercise, the manufacture on a large scale, great care and skill on the part of its operators, and the use of vegetable products of quality seldom found in commerce to secure the best results. Its general application, therefore, is far from being a universal one.

The process of triturating the oil with magnesium carbonate is directed for the property possessed of reducing, mechanically, the size of the oily globules in order to present a greater surface to the solvent action of the water. The main objection to its use, rests upon the fact of its appreciable solubility in distilled water and to a still greater extent, when ordinary water containing in solution, as it usually does, carbonic oxide. The medicated waters thus made and holding in solution this alkaline-earth salt may, when prescribed with alkaloids, their salts or certain metallic oxides, precipitate them from solution on standing and possibly lead to grave and serious results. To overcome this defect the substitution of paper-pulp, chalk, pumice stone or charcoal has been proposed. These, however, are poor expedients and all fail through their inherent lack of the necessary power of diffusion of the oily ingredient upon trituration. The advantages of the "Trituration Process" to the general pharmacist are so manifold that they scarcely need comment. The readiness of manufacture on a small scale, the short time necessary for its performance with results equally satisfactory, except in a few isolated instances, and the cheapness of preparation are a few of the points of value which yield it preference for general usage.

The late revision of our recognized authority discards, entirely, the use of the "Trituration Process" and employs in its stead a method which consists, simply, in the distribution of the oil, in small portions at a time, upon cotton; picking the same apart after each addition until the whole is thoroughly impregnated with it, packing in a conical glass percolator and displacing with distilled water. The exceptions to this mode are bitter almond water, prepared by direct solution of the oil in water by agitation, rose and orange flower waters made by distillation. A practical acquaintance with this process does not impress one with either its worth or general utility. Its supposed advantages are more than counterbalanced by the very unsatisfactory results arising from its use. In the first place when the oil is added to the cotton, no matter how faithfully its dissemination may be executed, a large pro-

portion is necessarily lost upon the fingers in picking the fibres apart. Then when it is placed in the percolator, if packed too loose, the added water rushes through without dissolving any of the oil. If too tight: the process is impeded to such an extent that percolation becomes impossible. The right degree of packing is hard to obtain and when secured yields but little better results. As to the use of distilled water, very few follow the pharmacopœial directions in this particular. Without exceptions, all pharmacists with whom the author has conversed, substitute ordinary water and claim in extenuation, that extreme purity of that liquid is unnecessary, and that they are perfectly justified in the replacement from the fact that distilled water is frequently of a musty, unpleasant odor, vapid and disagreeable taste and as likely may contain metallic impurities from the uncertain, careless methods of commercial manufacture; further their efficiency is called into question from the physiological fact that distilled water is difficult of digestion and not as acceptable to irritable stomachs. These statements may be regarded as extreme, yet it must be admitted that the greatest efficiency of all medicines is desired, in a physiological sense as well as a pharmaceutical one. If the reasons advanced are tenable and do not arise from economic considerations they are certainly worthy of further notice. Certain it is that the products made by them, seem to give equal satisfaction with those made by standard authority. In whatever way we view the U. S. (1880) process, its wasteful and objectionable manipulations are so evident, that if the imperfections in the directions of the earlier Pharmacopœia (1870) were open to severe comment, those of the latter (1880) are doubly so by comparison.

As previously stated, the greater the subdivision of an oil, when brought in contact with an aqueous solvent, the larger the quantity that will necessarily be taken up in solution. As an aid to this fact and also their supposed insolubility, rests the adaptability of the bodies mentioned above as diffusive agents. Some of the objections to the use of magnesium carbonate and several of its proposed substitutes have already been noted. Upon trial I have found precipitated calcium carbonate to be preferable, mechanically, to the magnesium salt; yet it is open to the same adverse criticisms. Another possibly important objection to the use of alkaline earth carbonates, which has not been previously discussed, may reside in the fact of the presence of odorous volatile acids, ethers, etc., in the volatile oils used and the neutralization of those acids by the alkaline carbonates, to form neutral and

inodorous bodies, which may or may not be soluble. This view is a plausible one when we consider the delicate chemical constitution of the oils in general, especially those containing the previously mentioned compounds. Upon this fact may be based the superiority of "Distilled" over "Triturated" waters, as in distillation the water is impregnated with the oil direct and unchanged; while in trituration, if performed with carbonates, some changes undoubtedly ensue, since the products from the latter process are of less fine qualities than those of the former; although both may be made from the same oil. It is absolutely necessary on this account, to use a body free from these objectionable features and one which has all the essential requisites in the greatest degree. After numerous trials I have found precipitated calcium phosphate to possess all the desired properties and to yield products that were in all respects the equal of those obtained by distillation.

This lime salt is a neutral, impalpable solid, wholly insoluble in water, neutral or carbonated, and when used permits filtration much more readily and effectively than any other medium. In diffusive power it is fully the equal of any of the bodies previously mentioned; leaving nothing to be desired. Before its use, although generally very pure, tests should be always applied to determine that fact. It should be wholly soluble in dilute hydrochloric acid without effervescence (absence of carbonates). Its washings with distilled water should yield no opalescence or precipitate with test solutions of silver nitrate (absence of chlorides), barium chloride (absence of sulphates) or ammonium oxalate (absence of soluble lime salts).

When diffusive agents are used, they require long and persistent trituration with the oil to effect thorough and minute subdivision. In order to promote this diffusion, a plan of diluting the oil with a small quantity of alcohol was tried and found to work admirably. The presumed presence of alcohol in medicated waters thus made, has no foundation in fact, if the directions in the general formula, hereinafter given, are followed, as the rubbing to dryness, necessarily volatilizes the whole of it.

General Formula.—"Triturate, in a mortar of broad surface, the oil dissolved in the alcohol, with the precipitated calcium phosphate, until a dry powder is secured and all the alcohol has volatilized, then add the water in small portions at a time, stirring after each addition, until the intended quantity to be made is completed. Lastly, filter; returning to the filter the first portions, if cloudy."

The following formulæ, under each heading, are expressed in two ways. One according to the method of the U. S. P. of 1870, and the other like that of the U. S. P. of 1880.

Aqua Anethi, Br.—Oil of dill half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of dill 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Anisi, U. S.—Oil of anise half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of anise 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Aurantii Florum, U. S.—Oil of neroli (Bigarade) twelve minims, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of neroli (Bigarade) 2 parts, alcohol 15 parts, precipitated calcium phosphate 20 parts, distilled water a sufficient quantity to make the finished product weigh 2,500 parts.

Aqua Amygdalæ Amaræ, U. S.—Oil of bitter almonds 15 minims, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of bitter almonds 1 part, distilled water a sufficient quantity to make the finished product weigh 1,000 parts. Dissolve the oil directly in the water by agitation. Since 1 part of the oil is soluble in 300 parts of water, no further directions are necessary.

Aqua Camphoræ, U. S.—Camphor two drachms, alcohol one and a half fluidrachms, precipitated calcium phosphate four drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, camphor 8 parts, alcohol 6 parts, precipitated calcium phosphate 15 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts. Reduce the camphor in a mortar to a thin, smooth paste with the alcohol, add the precipitated calcium phosphate, and proceed as in general formula.

Aqua Cinnamomi, U. S.—Oil of cinnamon (Ceylon) half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished

product measure two pints. Or, oil of cinnamon (Ceylon) 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Fœniculi, U. S.—Oil of fennel half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of fennel 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Menthæ Piperitæ, U. S.—Oil of peppermint half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of peppermint 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Menthæ Viridis, U. S.—Oil of Spearmint half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of spearmint 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Pimentæ, Br.—Oil of allspice half a fluidrachm, alcohol one and a half fluidrachms, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of allspice 2 parts, alcohol 6 parts, precipitated calcium phosphate 8 parts, distilled water a sufficient quantity to make the finished product weigh 1,000 parts.

Aqua Rosæ, U. S.—Oil of rose six minims, alcohol one fluidrachm, precipitated calcium phosphate two drachms, distilled water a sufficient quantity to make the finished product measure two pints. Or, oil of rose 2 parts, alcohol thirty parts, precipitated calcium phosphate 40 parts, distilled water a sufficient quantity to make the finished product weigh 5,000 parts.

In conclusion, the author, in advocating the adoption of the preceding formulæ would say that any means used to insure success, are always secondary in importance to the quality of the materials used. No process, however good in itself, can hope to remedy defects in the qualities of its ingredients, or the hasty, careless manipulations of its operators. With these guarded against, there need be no disappointment in the results obtained.

TABLES OF PERCENTAGE AND SPECIFIC GRAVITY OF ALCOHOL.

BY GUSTAVUS PILE.

Read at the Pharmaceutical Meeting, January 15, 1884.

In a paper read at one of the Phaamaceutical Meetings last spring, I called attention to the alcohol tables of the Pharmacopœia of 1880, and showed that they differed materially from the scale of Tralles, and might mislead one in determining the value of alcoholic mixtures. Alcohol having a specific gravity of .8157 has been regarded as 95 per cent. for so long a time that it would seem to be difficult to interpret it any other way, but by the adoption of the tables of Hehner, such will be the case, and 95 per cent. will have a specific gravity of .8161, and so on.

In order to show some of the differences between the two tables, I give a few of the percentages from each, side by side, the variations between them being seen at a glance.

Specific Gravity.	Tralles		Hehner.	
	Weight.	Volume.	Weight.	Volume.
1.0000	.....	.....	.00	.00
.9857	8.05	10.00	8.86	11.00
.9751	16.29	20.00	17.17	21.00
.9646	24.69	30.00	25.43	30.00
.9510	33.39	40.00	34.05	40.79
.9335	42.52	50.00	43.00	50.57
.9126	52.19	60.00	52.41	60.25
.8892	62.50	70.00	62.73	70.27
.8631	73.59	80.00	73.75	80.19
.8332	85.75	90.00	85.06	90.23
.7939	100.00	100.00	99.97	99.98

As will be here seen, the alcoholometers as now made will necessitate a correction each time they are used; and to me, as a maker of them, the question will be which table to follow in the future. I endeavor to have my hydrometers true to as small a fraction as it is possible to read them, but these tables show variations from .02 up to nearly 2 whole degrees, a fact that cannot but lead to confusion. This is unfortunate, and is about equivalent to having a new value placed on the present fluidounce, and asking the pharmacist either to make an allowance when using his graduates, or else throw them aside and procure a new supply.

Being convinced of the unfeasibility of displacing the scale of

Tralles in this country, I have given considerable time to preparing the following tables from that scale, and after the same extended form as those published in the Pharmacopœia. They indicate, for each degree of specific gravity, the percentage of absolute alcohol, both by weight and volume, from water having a specific gravity of .9991 at 60° Fahr., to absolute alcohol of .7939 at the same temperature. These tables will be found to meet every requirement, and, at the same time, free from the inaccuracies that exist in those before noticed.

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
.9991 0	.00 .05	.00 .06						
.9989 8	.10 .16	.13 .19	.9949 8	2.29 2.34	2.86 2.93	.9909 8	4.61 4.68	5.77 5.85
7	.21 .26	.26 .33	7	2.40 2.46	3.00 3.07	7	4.74 4.80	5.92 6.00
6	.32 .37	.40 .46	6	2.51 2.57	3.14 3.22	6	4.86 4.93	6.08 6.16
5	.44 .49	.53 .59	5	2.63 2.68	3.29 3.36	5	4.99 5.05	6.23 6.31
4	.58 .63	.66 .73	4	2.74 2.80	3.43 3.50	4	5.11 5.18	6.39 6.46
3			3			3		
2			2			2		
1			1			1		
0			0			0		
.9979 8	.64 .69	.80 .86	.9939 8	2.86 2.91	3.57 3.64	.9899 8	5.24 5.30	6.54 6.62
7	.74 .79	.93 1.00	7	2.97 3.03	3.71 3.79	7	5.37 5.43	6.69 6.77
6	.80 .85	1.06 1.13	6	3.09 3.14	3.86 3.93	6	5.49 5.56	6.85 6.92
5	.90 .96	1.19 1.26	5	3.20 3.26	4.00 4.07	5	5.62 5.69	7.00 7.08
4	1.01 1.06	1.32 1.40	4	3.31 3.37	4.14 4.21	4	5.76 5.82	7.16 7.25
3			3			3		
2			2			2		
1			1			1		
0			0			0		
.9969 8	1.17 1.22	1.46 1.53	.9929 8	3.43 3.48	4.29 4.36	.9889 8	5.89 5.96	7.33 7.41
7	1.28 1.33	1.60 1.66	7	3.54 3.60	4.43 4.50	7	6.02 6.09	7.50 7.58
6	1.38 1.44	1.73 1.80	6	3.65 3.71	4.57 4.64	6	6.16 6.22	7.66 7.75
5	1.49 1.54	1.86 1.93	5	3.77 3.82	4.71 4.78	5	6.29 6.36	7.83 7.91
4	1.60 1.66	2.00 2.07	4	3.88 3.94	4.86 4.93	4	6.43 6.50	8.00 8.08
3			3			3		
2			2			2		
1			1			1		
0			0			0		
.9959 8	1.72 1.77	2.14 2.21	.9919 8	4.00 4.06	5.00 5.08	.9879 8	6.57 6.63	8.16 8.25
7	1.83 1.89	2.28 2.36	7	4.12 4.18	5.16 5.23	7	6.70 6.77	8.33 8.41
6	1.95 2.00	2.43 2.50	6	4.24 4.30	5.31 5.39	6	6.84 6.90	8.50 8.58
5	2.06 2.12	2.57 2.64	5	4.37 4.43	5.46 5.54	5	6.97 7.04	8.66 8.75
4	2.17 2.23	2.72 2.79	4	4.49 4.55	5.62 5.69	4	7.11 7.17	8.83 8.91
3			3			3		
2			2			2		
1			1			1		
0			0			0		

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
9809	7.24	9.00	9809	11.56	14.30	9749	16.46	20.20
8	7.31	9.08	8	11.64	14.40	8	16.54	20.30
7	7.37	9.16	7	11.73	14.50	7	16.63	20.40
6	7.44	9.25	6	11.81	14.60	6	16.71	20.50
5	7.51	9.33	5	11.89	14.70	5	16.79	20.60
4	7.58	9.41	4	11.98	14.80	4	16.87	20.70
3	7.64	9.50	3	12.06	14.90	3	16.96	20.80
2	7.71	9.58	2	12.14	15.00	2	17.04	20.90
1	7.78	9.66	1	12.22	15.09	1	17.12	21.00
0	7.84	9.75	0	12.30	15.18	0	17.21	21.10
9859	7.91	9.83	9799	12.37	15.27	9739	17.29	21.20
8	7.98	9.91	8	12.45	15.36	8	17.37	21.30
7	8.05	10.00	7	12.53	15.45	7	17.46	21.40
6	8.12	10.08	6	12.60	15.54	6	17.54	21.50
5	8.18	10.16	5	12.68	15.63	5	17.62	21.60
4	8.24	10.25	4	12.75	15.72	4	17.70	21.70
3	8.31	10.33	3	12.83	15.81	3	17.79	21.80
2	8.38	10.41	2	12.90	15.90	2	17.87	21.90
1	8.45	10.50	1	12.97	16.00	1	17.95	22.00
0	8.51	10.58	0	13.05	16.10	0	18.03	22.09
9849	8.58	10.66	9789	13.13	16.20	9729	18.10	22.18
8	8.65	10.75	8	13.22	16.30	8	18.18	22.27
7	8.72	10.83	7	13.30	16.40	7	18.25	22.36
6	8.79	10.91	6	13.38	16.50	6	18.33	22.45
5	8.86	11.00	5	13.47	16.60	5	18.40	22.54
4	8.94	11.09	4	13.55	16.70	4	18.48	22.63
3	9.01	11.18	3	13.63	16.80	3	18.55	22.72
2	9.09	11.27	2	13.72	16.90	2	18.63	22.81
1	9.16	11.36	1	13.80	17.00	1	18.70	22.90
0	9.24	11.45	0	13.88	17.10	0	18.78	23.00
9839	9.31	11.54	9779	13.97	17.20	9719	18.87	23.10
8	9.39	11.63	8	14.05	17.30	8	18.95	23.20
7	9.46	11.72	7	14.13	17.40	7	19.04	23.30
6	9.54	11.81	6	14.22	17.50	6	19.12	23.40
5	9.62	11.90	5	14.30	17.60	5	19.20	23.50
4	9.68	12.00	4	14.38	17.70	4	19.29	23.60
3	9.75	12.09	3	14.47	17.80	3	19.37	23.70
2	9.83	12.18	2	14.55	17.90	2	19.45	23.80
1	9.90	12.27	1	14.63	18.00	1	19.54	23.90
0	9.98	12.36	0	14.72	18.10	0	19.62	24.00
9829	10.05	12.45	9769	14.80	18.20	9709	19.71	24.10
8	10.13	12.54	8	14.88	18.30	8	19.79	24.20
7	10.20	12.63	7	14.97	18.40	7	19.87	24.30
6	10.28	12.72	6	15.05	18.50	6	19.96	24.40
5	10.35	12.81	5	15.13	18.60	5	20.04	24.50
4	10.43	12.90	4	15.21	18.70	4	20.12	24.60
3	10.50	13.00	3	15.30	18.80	3	20.21	24.70
2	10.58	13.09	2	15.38	18.90	2	20.29	24.80
1	10.65	13.18	1	15.46	19.00	1	20.37	24.90
0	10.73	13.27	0	15.55	19.10	0	20.46	25.00
9819	10.80	13.36	9759	15.63	19.20	9699	20.54	25.10
8	10.88	13.45	8	15.71	19.30	8	20.61	25.19
7	10.95	13.54	7	15.80	19.40	7	20.69	25.28
6	11.03	13.63	6	15.88	19.50	6	20.77	25.37
5	11.10	13.72	5	15.96	19.60	5	20.84	25.46
4	11.18	13.81	4	16.05	19.70	4	20.92	25.55
3	11.25	13.90	3	16.13	19.80	3	21.00	25.64
2	11.32	14.00	2	16.21	19.90	2	21.07	25.73
1	11.40	14.10	1	16.29	20.00	1	21.15	25.82
0	11.48	14.20	0	16.38	20.10	0	21.23	25.91

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Vol'e.
•9689	21.30	26.00	•9629	25.90	31.42	•9569	29.92	36.07
8	21.38	26.10	8	25.97	31.50	8	29.98	36.14
7	21.47	26.20	7	26.05	31.59	7	30.05	36.22
6	21.55	26.30	6	26.12	31.67	6	30.11	36.29
5	21.63	26.40	5	26.19	31.75	5	30.17	36.36
4	21.72	26.50	4	26.26	31.84	4	30.24	36.43
3	21.80	26.60	3	26.33	31.92	3	30.30	36.50
2	21.88	26.70	2	26.40	32.00	2	30.36	36.58
1	21.97	26.80	1	26.47	32.08	1	30.43	36.65
0	22.05	26.90	0	26.53	32.15	0	30.49	36.72
•9679	22.14	27.00	•9619	26.60	32.23	•9559	30.55	36.79
8	22.22	27.10	8	26.67	32.31	8	30.62	36.86
7	22.30	27.19	7	26.73	32.38	7	30.68	36.93
6	22.38	27.28	6	26.80	32.46	6	30.74	37.00
5	22.45	27.37	5	26.87	32.54	5	30.80	37.07
4	22.53	27.46	4	26.93	32.61	4	30.86	37.14
3	22.61	27.55	3	27.00	32.69	3	30.92	37.20
2	22.68	27.64	2	27.07	32.77	2	30.98	37.27
1	22.76	27.73	1	27.13	32.84	1	31.04	37.34
0	22.84	27.82	0	27.20	32.92	0	31.10	37.40
•9669	22.91	27.91	•9609	27.26	33.00	•9549	31.15	37.47
8	22.99	28.00	8	27.33	33.08	8	31.21	37.54
7	23.07	28.10	7	27.40	33.15	7	31.27	37.60
6	23.15	28.19	6	27.46	33.23	6	31.33	37.67
5	23.22	28.28	5	27.53	33.31	5	31.39	37.74
4	23.30	28.37	4	27.60	33.38	4	31.45	37.80
3	23.38	28.46	3	27.66	33.46	3	31.50	37.87
2	23.45	28.55	2	27.73	33.54	2	31.56	37.94
1	23.53	28.64	1	27.80	33.61	1	31.62	38.00
0	23.61	28.73	0	27.86	33.69	0	31.68	38.07
•9659	23.68	28.82	•9599	27.93	33.77	•9539	31.74	38.14
8	23.76	28.91	8	28.00	33.84	8	31.80	38.20
7	23.84	29.00	7	28.06	33.92	7	31.86	38.27
6	23.92	29.10	6	28.12	34.00	6	31.92	38.34
5	24.00	29.19	5	28.19	34.08	5	31.97	38.40
4	24.07	29.28	4	28.26	34.15	4	32.03	38.47
3	24.15	29.37	3	28.32	34.23	3	32.09	38.54
2	24.23	29.46	2	28.39	34.31	2	32.15	38.60
1	24.31	29.55	1	28.46	34.38	1	32.21	38.67
0	24.38	29.64	0	28.52	34.46	0	32.27	38.74
•9649	24.46	29.73	•9589	28.59	34.54	•9529	32.33	38.80
8	24.54	29.82	8	28.66	34.61	8	32.38	38.87
7	24.61	29.91	7	28.72	34.69	7	32.44	38.94
6	24.69	30.00	6	28.79	34.77	6	32.50	39.00
5	24.76	30.09	5	28.86	34.84	5	32.55	39.06
4	24.83	30.17	4	28.92	34.92	4	32.61	39.12
3	24.90	30.25	3	28.99	35.00	3	32.66	39.18
2	24.98	30.34	2	29.06	35.08	2	32.72	39.25
1	25.05	30.42	1	29.12	35.15	1	32.77	39.31
0	25.12	30.50	0	29.19	35.23	0	32.83	39.37
•9639	25.19	30.59	•9579	29.26	35.31	•9519	32.88	39.43
8	25.26	30.67	8	29.32	35.38	8	32.94	39.50
7	25.33	30.75	7	29.39	35.46	7	33.00	39.56
6	25.40	30.84	6	29.46	35.54	6	33.05	39.62
5	25.47	30.92	5	29.52	35.61	5	33.11	39.68
4	25.54	31.00	4	29.59	35.69	4	33.16	39.75
3	25.61	31.09	3	29.66	35.77	3	33.22	39.81
2	25.68	31.17	2	29.72	35.84	2	33.28	39.87
1	25.76	31.25	1	29.79	35.92	1	33.33	39.93
0	25.83	31.34	0	29.86	36.00	0	33.39	40.00

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
9500	33.44	40.06	9449	36.73	43.70	9389	39.84	47.11
8	33.50	40.12	8	36.78	43.76	8	39.89	47.17
7	33.56	40.18	7	36.83	43.82	7	39.94	47.22
6	33.61	40.25	6	36.89	43.88	6	40.00	47.28
5	33.67	40.31	5	36.94	43.94	5	40.05	47.33
4	33.73	40.37	4	36.99	44.00	4	40.10	47.39
3	33.78	40.43	3	37.05	44.06	3	40.15	47.44
2	33.84	40.50	2	37.10	44.12	2	40.20	47.50
1	33.90	40.56	1	37.15	44.18	1	40.25	47.55
0	33.95	40.62	0	37.21	44.23	0	40.30	47.61
9490	34.01	40.68	9439	37.26	44.29	9379	40.35	47.66
8	34.06	40.75	8	37.31	44.35	8	40.40	47.72
7	34.12	40.81	7	37.37	44.41	7	40.45	47.77
6	34.17	40.87	6	37.42	44.47	6	40.51	47.83
5	34.23	40.93	5	37.47	44.53	5	40.56	47.88
4	34.28	41.00	4	37.53	44.59	4	40.61	47.94
3	34.34	41.06	3	37.58	44.65	3	40.66	48.00
2	34.40	41.12	2	37.63	44.70	2	40.71	48.05
1	34.45	41.18	1	37.69	44.76	1	40.76	48.10
0	34.51	41.25	0	37.74	44.82	0	40.81	48.16
9489	34.57	41.31	9429	37.79	44.88	9369	40.86	48.21
8	34.62	41.37	8	37.85	44.94	8	40.91	48.26
7	34.68	41.43	7	37.90	45.00	7	40.96	48.32
6	34.74	41.50	6	37.95	45.05	6	41.00	48.37
5	34.79	41.56	5	38.00	45.11	5	41.05	48.42
4	34.85	41.62	4	38.05	45.17	4	41.10	48.48
3	34.91	41.68	3	38.10	45.22	3	41.15	48.53
2	34.96	41.75	2	38.15	45.28	2	41.20	48.58
1	35.01	41.81	1	38.20	45.33	1	41.25	48.64
0	35.07	41.87	0	38.25	45.39	0	41.30	48.69
9479	35.13	41.93	9419	38.31	45.45	9359	41.35	48.74
8	35.18	42.00	8	38.36	45.50	8	41.40	48.80
7	35.23	42.06	7	38.41	45.56	7	41.44	48.85
6	35.28	42.12	6	38.46	45.61	6	41.49	48.90
5	35.34	42.18	5	38.51	45.67	5	41.54	48.95
4	35.39	42.24	4	38.56	45.73	4	41.59	49.00
3	35.44	42.30	3	38.61	45.78	3	41.64	49.06
2	35.50	42.35	2	38.67	45.84	2	41.69	49.11
1	35.55	42.41	1	38.72	45.89	1	41.74	49.16
0	35.60	42.47	0	38.77	45.95	0	41.79	49.22
9469	35.66	42.53	9409	38.82	46.00	9349	41.84	49.27
8	35.71	42.59	8	38.87	46.06	8	41.89	49.32
7	35.76	42.65	7	38.92	46.12	7	41.94	49.38
6	35.82	42.70	6	38.97	46.17	6	41.99	49.43
5	35.87	42.76	5	39.02	46.23	5	42.04	49.48
4	35.92	42.82	4	39.08	46.28	4	42.09	49.53
3	35.98	42.88	3	39.13	46.34	3	42.13	49.59
2	36.03	42.94	2	39.18	46.40	2	42.18	49.64
1	36.08	43.00	1	39.23	46.45	1	42.23	49.69
0	36.14	43.06	0	39.28	46.51	0	42.28	49.75
9459	36.19	43.12	9399	39.33	46.56	9339	42.33	49.80
8	36.24	43.18	8	39.38	46.62	8	42.38	49.85
7	36.30	43.23	7	39.43	46.68	7	42.42	49.90
6	36.35	43.29	6	39.49	46.73	6	42.47	49.95
5	36.40	43.35	5	39.54	46.79	5	42.52	50.00
4	36.46	43.41	4	39.59	46.84	4	42.57	50.05
3	36.51	43.47	3	39.64	46.90	3	42.62	50.10
2	36.56	43.53	2	39.69	46.95	2	42.66	50.15
1	36.62	43.59	1	39.74	47.00	1	42.71	50.20
0	36.67	43.65	0	39.79	47.06	0	42.76	50.25

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
•9320	42°30	50°30	•9260	45°64	53°20	•9200	48°46	56°19
8	42°35	50°35	8	45°68	53°34	8	48°51	56°24
7	42°40	50°40	7	45°73	53°38	7	48°55	56°28
6	42°44	50°45	6	45°77	53°43	6	48°60	56°33
5	42°49	50°50	5	45°82	53°48	5	48°65	56°38
4	43°04	50°55	4	45°86	53°53	4	48°69	56°43
3	43°08	50°60	3	45°91	53°57	3	48°74	56°47
2	43°13	50°65	2	45°95	53°62	2	48°79	56°52
1	43°18	50°70	1	46°00	53°67	1	48°83	56°57
0	43°22	50°75	0	46°05	53°72	0	48°88	56°62
•9319	43°27	50°80	•9259	46°09	53°76	•9199	48°93	56°66
8	43°32	50°85	8	46°14	53°81	8	48°97	56°71
7	43°36	50°90	7	46°19	53°86	7	49°02	56°76
6	43°41	50°95	6	46°23	53°90	6	49°07	56°81
5	43°46	51°00	5	46°28	53°95	5	49°11	56°85
4	43°51	51°05	4	46°33	54°00	4	49°16	56°90
3	43°55	51°10	3	46°38	54°05	3	49°21	56°95
2	43°60	51°15	2	46°43	54°10	2	49°25	57°00
1	43°65	51°20	1	46°48	54°15	1	49°30	57°04
0	43°69	51°25	0	46°52	54°20	0	49°34	57°09
•9309	43°74	51°30	•9249	46°57	54°25	•9189	49°38	57°14
8	43°79	51°35	8	46°62	54°30	8	49°43	57°18
7	43°84	51°40	7	46°67	54°35	7	49°47	57°23
6	43°88	51°45	6	46°71	54°40	6	49°52	57°28
5	43°93	51°50	5	46°76	54°45	5	49°56	57°32
4	43°98	51°55	4	46°81	54°50	4	49°61	57°37
3	44°03	51°60	3	46°86	54°55	3	49°65	57°41
2	44°08	51°65	2	46°91	54°60	2	49°69	57°46
1	44°12	51°70	1	46°95	54°65	1	49°74	57°51
0	44°17	51°75	0	47°00	54°70	0	49°78	57°55
•9299	44°22	51°80	•9239	47°05	54°75	•9179	49°83	57°60
8	44°27	51°85	8	47°10	54°80	8	49°87	57°64
7	44°31	51°90	7	47°15	54°85	7	49°92	57°69
6	44°36	51°95	6	47°20	54°90	6	49°96	57°74
5	44°41	52°00	5	47°25	54°95	5	50°00	57°78
4	44°46	52°05	4	47°30	55°00	4	50°05	57°83
3	44°50	52°10	3	47°35	55°05	3	50°09	57°87
2	44°55	52°15	2	47°40	55°10	2	50°14	57°92
1	44°60	52°20	1	47°44	55°14	1	50°18	57°96
0	44°65	52°25	0	47°49	55°19	0	50°23	58°00
•9289	44°69	52°30	•9229	47°54	55°24	•9169	50°27	58°05
8	44°74	52°35	8	47°59	55°29	8	50°32	58°09
7	44°79	52°40	7	47°63	55°33	7	50°36	58°14
6	44°84	52°45	6	47°68	55°38	6	50°41	58°19
5	44°88	52°50	5	47°73	55°43	5	50°45	58°23
4	44°93	52°55	4	47°77	55°48	4	50°50	58°28
3	44°98	52°60	3	47°82	55°52	3	50°54	58°32
2	45°03	52°65	2	47°87	55°57	2	50°59	58°37
1	45°07	52°70	1	47°91	55°62	1	50°63	58°42
0	45°12	52°75	0	47°96	55°67	0	50°68	58°46
•9279	45°17	52°80	•9219	48°00	55°71	•9159	50°72	58°51
8	45°22	52°85	8	48°05	55°76	8	50°76	58°55
7	45°27	52°90	7	48°09	55°81	7	50°81	58°60
6	45°32	52°95	6	48°14	55°86	6	50°85	58°64
5	45°37	53°00	5	48°18	55°90	5	50°89	58°69
4	45°41	53°05	4	48°23	55°95	4	50°94	58°73
3	45°46	53°10	3	48°27	56°00	3	50°98	58°78
2	45°50	53°15	2	48°32	56°05	2	51°03	58°82
1	45°55	53°20	1	48°37	56°10	1	51°07	58°87
0	45°59	53°24	0	48°41	56°14	0	51°12	58°92

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
9149	51.16	58.96	9089	53.86	61.68	9029	56.52	64.30
8	51.21	59.00	8	53.90	61.73	8	56.57	64.34
7	51.25	59.05	7	53.95	61.77	7	56.61	64.39
6	51.30	59.09	6	54.00	61.82	6	56.66	64.43
5	51.34	59.14	5	54.04	61.86	5	56.70	64.47
4	51.39	59.19	4	54.09	61.91	4	56.75	64.52
3	51.43	59.23	3	54.13	61.95	3	56.79	64.56
2	51.48	59.28	2	54.18	62.00	2	56.84	64.60
1	51.52	59.32	1	54.22	62.04	1	56.88	64.65
0	51.57	59.37	0	54.26	62.08	0	56.93	64.69
9139	51.61	59.41	9079	54.31	62.13	9019	56.97	64.73
8	51.66	59.46	8	54.35	62.17	8	57.02	64.78
7	51.70	59.50	7	54.40	62.21	7	57.06	64.82
6	51.75	59.55	6	54.44	62.26	6	57.11	64.87
5	51.79	59.59	5	54.48	62.30	5	57.15	64.91
4	51.83	59.64	4	54.53	62.34	4	57.20	64.95
3	51.88	59.68	3	54.57	62.39	3	57.24	65.00
2	51.92	59.73	2	54.61	62.43	2	57.29	65.04
1	51.97	59.77	1	54.66	62.47	1	57.33	65.08
0	52.01	59.82	0	54.70	62.52	0	57.37	65.12
9129	52.06	59.86	9069	54.75	62.56	9009	57.42	65.16
8	52.10	59.91	8	54.79	62.60	8	57.46	65.20
7	52.15	59.95	7	54.83	62.65	7	57.50	65.25
6	52.19	60.00	6	54.88	62.69	6	57.55	65.29
5	52.24	60.05	5	54.92	62.73	5	57.59	65.33
4	52.28	60.09	4	54.97	62.78	4	57.64	65.37
3	52.33	60.14	3	55.01	62.82	3	57.68	65.41
2	52.37	60.19	2	55.05	62.87	2	57.72	65.45
1	52.42	60.23	1	55.10	62.91	1	57.77	65.50
0	52.46	60.28	0	55.14	62.95	0	57.82	65.54
9119	52.51	60.32	9059	55.19	63.00	8999	57.86	65.58
8	52.55	60.37	8	55.23	63.04	8	57.90	65.62
7	52.60	60.41	7	55.27	63.08	7	57.95	65.66
6	52.64	60.46	6	55.32	63.13	6	57.99	65.70
5	52.69	60.50	5	55.36	63.17	5	58.03	65.75
4	52.73	60.55	4	55.41	63.21	4	58.08	65.79
3	52.78	60.59	3	55.45	63.26	3	58.12	65.83
2	52.82	60.64	2	55.49	63.30	2	58.16	65.87
1	52.87	60.68	1	55.54	63.34	1	58.21	65.91
0	52.91	60.73	0	55.58	63.39	0	58.25	65.95
9109	52.96	60.77	9049	55.63	63.43	8989	58.29	66.00
8	53.00	60.82	8	55.67	63.47	8	58.34	66.04
7	53.05	60.86	7	55.71	63.52	7	58.38	66.08
6	53.09	60.91	6	55.76	63.56	6	58.42	66.12
5	53.14	60.95	5	55.80	63.60	5	58.47	66.16
4	53.18	61.00	4	55.85	63.65	4	58.51	66.20
3	53.23	61.05	3	55.89	63.69	3	58.56	66.25
2	53.27	61.09	2	55.94	63.73	2	58.60	66.29
1	53.32	61.14	1	55.98	63.78	1	58.64	66.33
0	53.36	61.19	0	56.02	63.82	0	58.69	66.37
9099	53.41	61.23	9039	56.07	63.87	8979	58.73	66.41
8	53.45	61.28	8	56.12	63.91	8	58.77	66.45
7	53.50	61.32	7	56.16	63.95	7	58.82	66.50
6	53.54	61.37	6	56.21	64.00	6	58.86	66.54
5	53.59	61.41	5	56.25	64.04	5	58.91	66.58
4	53.63	61.46	4	56.30	64.08	4	58.95	66.62
3	53.68	61.50	3	56.34	64.13	3	59.00	66.66
2	53.72	61.55	2	56.39	64.17	2	59.04	66.70
1	53.77	61.59	1	56.43	64.21	1	59.08	66.75
0	53.81	61.64	0	56.48	64.26	0	59.13	66.79

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
8909	59.17	66.83	8900	61.78	69.32	8849	64.32	71.72
8	59.21	66.87	8	61.83	69.35	8	64.37	71.76
7	59.25	66.91	7	61.87	69.40	7	64.41	71.80
6	59.30	66.95	6	61.91	69.44	6	64.45	71.84
5	59.34	67.00	5	61.95	69.48	5	64.50	71.88
4	59.38	67.04	4	62.00	69.52	4	64.54	71.92
3	59.43	67.08	3	62.04	69.56	3	64.58	71.96
2	59.47	67.12	2	62.08	69.60	2	64.63	72.00
1	59.52	67.16	1	62.12	69.64	1	64.67	72.04
0	59.56	67.21	0	62.16	69.68	0	64.71	72.08
8959	59.60	67.25	8890	62.21	69.72	8839	64.76	72.12
8	59.65	67.29	8	62.25	69.76	8	64.80	72.16
7	59.69	67.33	7	62.29	69.80	7	64.84	72.20
6	59.74	67.38	6	62.33	69.84	6	64.89	72.24
5	59.78	67.42	5	62.37	69.88	5	64.93	72.28
4	59.82	67.46	4	62.42	69.92	4	64.97	72.32
3	59.87	67.50	3	62.46	69.96	3	65.02	72.36
2	59.91	67.54	2	62.50	70.00	2	65.06	72.40
1	59.96	67.59	1	62.54	70.04	1	65.10	72.44
0	59.00	67.63	0	62.58	70.08	0	65.14	72.48
8949	60.04	67.67	8889	62.62	70.12	8829	65.19	72.52
8	60.09	67.71	8	62.67	70.16	8	65.23	72.56
7	60.13	67.75	7	62.71	70.20	7	65.27	72.60
6	60.18	67.80	6	62.75	70.24	6	65.32	72.64
5	60.22	67.84	5	62.79	70.28	5	65.36	72.68
4	60.26	67.88	4	62.84	70.32	4	65.40	72.72
3	60.31	67.92	3	62.88	70.36	3	65.44	72.76
2	60.35	67.96	2	62.92	70.40	2	65.49	72.80
1	60.39	68.00	1	62.96	70.44	1	65.53	72.84
0	60.44	68.05	0	63.01	70.48	0	65.57	72.88
8939	60.48	68.09	8879	63.05	70.52	8819	65.62	72.92
8	60.52	68.13	8	63.09	70.56	8	65.66	72.96
7	60.57	68.18	7	63.13	70.60	7	65.71	73.00
6	60.61	68.22	6	63.18	70.64	6	65.75	73.04
5	60.66	68.26	5	63.22	70.68	5	65.79	73.08
4	60.70	68.30	4	63.26	70.72	4	65.83	73.12
3	60.74	68.34	3	63.30	70.76	3	65.88	73.16
2	60.79	68.38	2	63.35	70.80	2	65.92	73.20
1	60.83	68.43	1	63.39	70.84	1	65.96	73.24
0	60.88	68.47	0	63.43	70.88	0	66.00	73.28
8929	60.92	68.51	8869	63.47	70.92	8809	66.05	73.31
8	60.96	68.55	8	63.52	70.96	8	66.09	73.35
7	61.01	68.59	7	63.56	71.00	7	66.13	73.39
6	61.05	68.63	6	63.60	71.04	6	66.17	73.43
5	61.10	68.67	5	63.64	71.08	5	66.22	73.47
4	61.14	68.72	4	63.69	71.12	4	66.26	73.51
3	61.18	68.76	3	63.73	71.16	3	66.30	73.54
2	61.23	68.80	2	63.77	71.20	2	66.35	73.58
1	61.27	68.84	1	63.81	71.24	1	66.39	73.62
0	61.31	68.88	0	63.86	71.28	0	66.43	73.66
8919	61.36	68.92	8859	63.90	71.32	8799	66.48	73.70
8	61.40	68.96	8	63.94	71.36	8	66.52	73.74
7	61.44	69.00	7	63.98	71.40	7	66.56	73.78
6	61.49	69.04	6	64.03	71.44	6	66.60	73.81
5	61.53	69.08	5	64.07	71.48	5	66.65	73.85
4	61.57	69.12	4	64.11	71.52	4	66.69	73.89
3	61.61	69.16	3	64.15	71.56	3	66.73	73.93
2	61.66	69.20	2	64.20	71.60	2	66.77	73.97
1	61.70	69.24	1	64.24	71.64	1	66.81	74.00
0	61.74	69.28	0	64.28	71.68	0	66.86	74.04

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
•8780	66.90	74.08	•8729	69.47	76.37	•8609	71.98	78.00
8	66.94	74.12	8	69.53	76.41	8	72.02	78.03
7	66.99	74.16	7	69.57	76.45	7	72.06	78.07
6	67.03	74.20	6	69.61	76.48	6	72.11	78.11
5	67.07	74.23	5	69.65	76.52	5	72.15	78.14
4	67.12	74.27	4	69.69	76.56	4	72.19	78.18
3	67.16	74.31	3	69.73	76.60	3	72.23	78.22
2	67.20	74.35	2	69.77	76.63	2	72.27	78.25
1	67.25	74.39	1	69.81	76.67	1	72.32	78.29
0	67.29	74.43	0	69.85	76.71	0	72.36	78.93
•8779	67.33	74.46	•8719	69.89	76.74	•8659	72.40	78.97
8	67.38	74.50	8	69.93	76.78	8	72.45	79.00
7	67.42	74.54	7	69.98	76.82	7	72.49	79.04
6	67.46	74.58	6	70.02	76.85	6	72.53	79.08
5	67.51	74.62	5	70.06	77.89	5	72.57	79.12
4	67.55	74.66	4	70.10	77.93	4	72.61	79.15
3	67.59	74.69	3	70.14	77.97	3	72.66	79.19
2	67.64	74.73	2	70.18	77.00	2	72.70	79.23
1	67.68	74.77	1	70.22	77.04	1	72.74	79.27
0	67.72	74.81	0	70.26	77.08	0	72.78	79.30
•8769	67.77	74.85	•8709	70.30	77.12	•8649	72.82	79.34
8	67.81	74.89	8	70.34	77.16	8	72.87	79.38
7	67.85	74.92	7	70.39	77.19	7	72.91	79.41
6	67.89	74.96	6	70.43	77.23	6	72.95	79.45
5	67.93	75.00	5	70.47	77.27	5	72.99	79.49
4	67.98	75.04	4	70.51	77.30	4	73.04	79.52
3	68.02	75.08	3	70.55	77.34	3	73.08	79.56
2	68.06	75.12	2	70.60	77.38	2	73.12	79.60
1	68.10	75.15	1	70.64	77.41	1	73.16	79.63
0	68.15	75.19	0	70.68	77.45	0	73.20	79.67
•8759	68.19	75.23	•8699	70.72	77.49	•8639	73.25	79.71
8	68.23	75.27	8	70.76	77.52	8	73.29	79.74
7	68.27	75.31	7	70.80	77.56	7	73.33	79.78
6	68.32	75.35	6	70.85	77.60	6	73.37	79.82
5	68.36	75.38	5	70.89	77.63	5	73.41	79.85
4	68.40	75.42	4	70.93	77.67	4	73.46	79.89
3	68.44	75.46	3	70.97	77.71	3	73.50	79.93
2	68.49	75.50	2	71.02	77.74	2	73.54	79.97
1	68.53	75.54	1	71.06	77.78	1	73.59	80.00
0	68.57	75.58	0	71.10	77.82	0	73.63	80.04
•8749	68.61	75.61	•8689	71.14	77.85	•8629	73.67	80.07
8	68.66	75.65	8	71.18	77.89	8	73.71	80.11
7	68.70	75.69	7	71.23	77.93	7	73.75	80.15
6	68.74	75.73	6	71.27	77.97	6	73.79	80.18
5	68.79	75.77	5	71.31	78.00	5	73.83	80.22
4	68.83	75.81	4	71.35	78.04	4	73.88	80.25
3	68.87	75.85	3	71.39	78.08	3	73.92	80.29
2	68.91	75.88	2	71.43	78.12	2	73.96	80.33
1	68.95	75.92	1	71.47	78.15	1	73.00	80.36
0	69.00	75.96	0	71.52	78.19	0	73.04	80.40
•8739	69.04	76.00	•8679	71.56	78.23	•8619	74.08	80.43
8	69.09	76.03	8	71.60	78.27	8	74.12	80.47
7	69.13	76.07	7	71.64	78.30	7	74.16	80.50
6	69.17	76.11	6	71.68	78.34	6	74.20	80.54
5	69.21	76.15	5	71.73	78.38	5	74.24	80.58
4	69.26	76.18	4	71.77	78.41	4	74.28	80.61
3	69.30	76.22	3	71.81	78.45	3	74.33	80.65
2	69.34	76.26	2	71.85	78.49	2	74.37	80.68
1	69.38	76.30	1	71.89	78.52	1	74.41	80.72
0	69.42	76.33	0	71.94	78.56	0	74.45	80.75

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
•8600	74.49	80.78	•8549	77.00	82.93	•8489	79.46	84.96
8	74.53	80.82	8	77.04	82.97	8	79.50	85.00
7	74.57	80.85	7	77.09	83.00	7	79.54	85.03
6	74.61	80.89	6	77.13	83.04	6	79.58	85.06
5	74.65	80.93	5	77.17	83.07	5	79.62	85.10
4	74.70	80.97	4	77.21	83.11	4	79.66	85.13
3	74.74	81.00	3	77.25	83.14	3	79.70	85.16
2	74.78	81.04	2	77.29	83.18	2	79.75	85.20
1	74.82	81.07	1	77.34	83.21	1	79.79	85.23
0	74.86	81.11	0	77.38	83.25	0	79.83	85.28
•8599	74.90	81.15	•8539	77.42	83.28	•8479	79.87	85.30
8	74.94	81.18	8	77.44	83.32	8	79.91	85.33
7	74.99	81.22	7	77.48	83.35	7	79.95	85.36
6	75.03	81.25	6	77.53	83.39	6	79.99	85.40
5	75.07	81.29	5	77.57	83.42	5	80.03	85.43
4	75.11	81.33	4	77.61	83.46	4	80.07	85.46
3	75.15	81.36	3	77.65	83.49	3	80.11	85.50
2	75.19	81.40	2	77.69	83.53	2	80.15	85.53
1	75.24	81.43	1	77.74	83.56	1	80.19	85.56
0	75.28	81.47	0	77.78	83.60	0	80.23	85.60
•8589	75.32	81.50	•8529	77.82	83.63	•8469	80.28	85.63
8	75.36	81.54	8	77.86	83.67	8	80.32	85.66
7	75.40	81.58	7	77.91	83.70	7	80.36	85.70
6	75.44	81.61	6	77.95	83.74	6	80.40	85.73
5	75.49	81.65	5	77.99	83.77	5	80.44	85.76
4	75.53	81.68	4	78.03	83.81	4	80.48	85.80
3	75.57	81.72	3	78.07	83.84	3	80.52	85.83
2	75.61	81.75	2	78.12	83.88	2	80.56	85.86
1	75.65	81.78	1	78.16	83.91	1	80.60	85.90
0	75.70	81.82	0	78.20	83.94	0	80.64	85.93
•8579	75.74	81.85	•8519	78.24	83.97	•8459	80.68	85.96
8	75.78	81.89	8	78.29	84.00	8	80.72	86.00
7	75.82	81.93	7	78.33	84.03	7	80.77	86.03
6	75.86	81.97	6	78.37	84.06	6	80.81	86.06
5	75.91	82.00	5	78.41	84.10	5	80.85	86.10
4	75.95	82.04	4	78.45	84.13	4	80.89	86.13
3	75.99	82.07	3	78.49	84.16	3	80.93	86.16
2	76.03	82.11	2	78.53	84.20	2	80.97	86.20
1	76.07	82.15	1	78.57	84.23	1	80.01	86.23
0	76.11	82.18	0	78.61	84.26	0	80.05	86.26
•8569	76.16	82.22	•8509	78.66	84.30	•8449	81.09	86.30
8	76.20	82.25	8	78.70	84.33	8	81.13	86.33
7	76.24	82.29	7	78.74	84.36	7	81.18	86.36
6	76.28	82.33	6	78.78	84.40	6	81.22	86.40
5	76.32	82.36	5	78.82	84.43	5	81.26	86.43
4	76.36	82.40	4	78.86	84.46	4	81.30	86.46
3	76.41	82.43	3	78.90	84.50	3	81.34	86.50
2	76.45	82.47	2	78.94	84.53	2	81.38	86.53
1	76.49	82.51	1	78.98	84.56	1	81.42	86.56
0	76.53	82.54	0	79.02	84.60	0	81.46	86.60
•8559	76.58	82.58	•8499	79.06	84.63	•8439	81.50	86.63
8	76.62	82.61	8	79.10	84.66	8	81.54	86.66
7	76.66	82.65	7	79.14	84.70	7	81.59	86.70
6	76.70	82.69	6	79.18	84.73	6	81.63	86.73
5	76.75	82.72	5	79.22	84.76	5	81.67	86.76
4	76.79	82.76	4	79.26	84.80	4	81.71	86.80
3	76.83	82.79	3	79.30	84.83	3	81.75	86.83
2	76.87	82.83	2	79.34	84.86	2	81.79	86.86
1	76.92	82.86	1	79.38	84.90	1	81.83	86.90
0	76.96	82.90	0	79.42	84.93	0	81.87	86.93

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
8429	81.91	86.96	8309	84.30	88.88	8309	86.66	90.70
8	81.95	87.00	8	84.34	88.91	8	86.70	90.73
7	82.00	87.03	7	84.38	88.94	7	86.74	90.76
6	82.04	87.06	6	84.42	88.97	6	86.78	90.79
5	82.08	87.09	5	84.46	89.00	5	86.82	90.82
4	82.12	87.13	4	84.50	89.03	4	86.85	90.85
3	82.16	87.16	3	84.54	89.06	3	86.89	90.88
2	82.20	87.19	2	84.58	89.09	2	86.93	90.91
1	82.24	87.22	1	84.62	89.12	1	86.97	90.94
0	82.28	87.26	0	84.65	89.15	0	87.01	90.97
8419	82.32	87.29	8359	84.69	89.18	8399	87.05	91.00
8	82.36	87.32	8	84.73	89.21	8	87.09	91.03
7	82.40	87.35	7	84.77	89.24	7	87.13	91.06
6	82.44	87.39	6	84.81	89.27	6	87.17	91.09
5	82.48	87.42	5	84.85	89.30	5	87.20	91.12
4	82.52	87.45	4	84.89	89.33	4	87.24	91.15
3	82.56	87.48	3	84.93	89.36	3	87.28	91.18
2	82.60	87.52	2	84.97	89.40	2	87.32	91.21
1	82.64	87.55	1	85.01	89.43	1	87.36	91.24
0	82.68	87.58	0	85.05	89.46	0	87.40	91.26
8409	82.72	87.61	8349	85.09	89.49	8389	87.44	91.29
8	82.76	87.65	8	85.13	89.52	8	87.48	91.32
7	82.80	87.68	7	85.16	89.55	7	87.52	91.35
6	82.84	87.71	6	85.20	89.58	6	87.56	91.38
5	82.88	87.74	5	85.24	89.61	5	87.60	91.41
4	82.92	87.78	4	85.28	89.64	4	87.63	91.44
3	82.96	87.81	3	85.32	89.67	3	87.67	91.47
2	83.00	87.84	2	85.36	89.70	2	87.71	91.50
1	83.04	87.87	1	85.40	89.73	1	87.75	91.53
0	83.08	87.91	0	85.44	89.76	0	87.79	91.56
8399	83.12	87.94	8339	85.48	89.79	8379	87.83	91.59
8	83.16	87.97	8	85.52	89.82	8	87.87	91.62
7	83.20	88.00	7	85.56	89.85	7	87.91	91.65
6	83.24	88.03	6	85.60	89.88	6	87.95	91.68
5	83.28	88.06	5	85.64	89.91	5	87.99	91.70
4	83.32	88.09	4	85.67	89.94	4	88.02	91.73
3	83.36	88.12	3	85.71	89.97	3	88.06	91.76
2	83.40	88.16	2	85.75	90.00	2	88.10	91.79
1	83.44	88.19	1	85.79	90.03	1	88.14	91.82
0	83.48	88.22	0	85.83	90.06	0	88.18	91.85
8389	83.52	88.25	8329	85.87	90.09	8369	88.22	91.88
8	83.56	88.28	8	85.91	90.12	8	88.26	91.91
7	83.60	88.32	7	85.95	90.15	7	88.30	91.94
6	83.64	88.35	6	85.99	90.18	6	88.34	91.97
5	83.68	88.38	5	86.03	90.21	5	88.37	92.00
4	83.72	88.41	4	86.07	90.24	4	88.41	92.03
3	83.76	88.44	3	86.11	90.27	3	88.45	92.06
2	83.80	88.47	2	86.15	90.30	2	88.49	92.09
1	83.83	88.50	1	86.19	90.33	1	88.53	92.12
0	83.87	88.53	0	86.23	90.36	0	88.56	92.15
8379	83.91	88.56	8319	86.27	90.39	8359	88.60	92.18
8	83.95	88.59	8	86.30	90.42	8	88.64	92.20
7	83.99	88.62	7	86.34	90.45	7	88.68	92.23
6	84.03	88.65	6	86.38	90.48	6	88.72	92.26
5	84.06	88.68	5	86.42	90.52	5	88.76	92.29
4	84.10	88.72	4	86.46	90.55	4	88.79	92.32
3	84.14	88.75	3	86.50	90.58	3	88.83	92.35
2	84.18	88.78	2	86.54	90.61	2	88.87	92.38
1	84.22	88.81	1	86.58	90.64	1	88.91	92.40
0	84.26	88.84	0	86.62	90.67	0	88.95	92.43

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
.8249	88.98	92.46	.8189	91.26	94.14	.8129	93.48	95.70
8	89.02	92.49	8	91.29	94.17	8	93.51	95.73
7	89.06	92.52	7	91.33	94.19	7	93.55	95.75
6	89.10	92.55	6	91.37	94.22	6	93.59	95.78
5	89.14	92.58	5	91.41	94.25	5	93.62	95.81
4	89.17	92.60	4	91.44	94.28	4	93.66	95.84
3	89.21	92.63	3	91.48	94.30	3	93.70	95.86
2	89.25	92.66	2	91.52	94.33	2	93.73	95.89
1	89.29	92.69	1	91.56	94.36	1	93.77	95.92
0	89.33	92.72	0	91.59	94.38	0	93.81	95.95
.8239	89.37	92.75	.8179	91.63	94.41	.8119	93.84	95.97
8	89.40	92.78	8	91.67	94.44	8	93.88	96.00
7	89.44	92.80	7	91.70	94.46	7	93.92	96.02
6	89.48	92.83	6	91.74	94.49	6	93.95	96.05
5	89.52	92.86	5	91.78	94.52	5	93.99	96.07
4	89.56	92.89	4	91.82	94.55	4	94.03	96.09
3	89.60	92.92	3	91.86	94.57	3	94.07	96.12
2	89.63	92.95	2	91.89	94.60	2	94.10	96.14
1	89.67	92.98	1	91.93	94.63	1	94.14	96.16
0	89.71	93.00	0	91.97	94.65	0	94.18	96.19
.8229	89.75	93.03	.8169	92.01	94.68	.8109	94.21	96.21
8	89.79	93.06	8	92.04	94.71	8	94.25	96.24
7	89.82	93.09	7	92.08	94.73	7	94.29	96.26
6	89.86	93.12	6	92.12	94.76	6	94.32	96.28
5	89.90	93.14	5	92.16	94.79	5	94.36	96.31
4	89.94	93.17	4	92.20	94.81	4	94.40	96.33
3	89.97	93.20	3	92.23	94.84	3	94.43	96.35
2	90.01	93.23	2	92.27	94.87	2	94.47	96.38
1	90.05	93.26	1	92.31	94.89	1	94.51	96.40
0	90.09	93.29	0	92.35	94.92	0	94.54	96.42
.8219	90.12	93.31	.8159	92.38	94.94	.8099	94.58	96.45
8	90.16	93.34	8	92.42	94.97	8	94.61	96.47
7	90.20	93.37	7	92.46	95.00	7	94.65	96.49
6	90.24	93.40	6	92.49	95.03	6	94.69	96.52
5	90.27	93.43	5	92.53	95.05	5	94.72	96.54
4	90.31	93.45	4	92.57	95.08	4	94.76	96.57
3	90.35	93.48	3	92.60	95.10	3	94.80	96.59
2	90.39	93.51	2	92.64	95.13	2	94.83	96.62
1	90.42	93.54	1	92.68	95.15	1	94.87	96.64
0	90.46	93.57	0	92.71	95.18	0	94.90	96.66
.8209	90.50	93.59	.8149	92.75	95.20	.8089	94.93	96.69
8	90.54	93.62	8	92.79	95.23	8	94.96	96.71
7	90.58	93.65	7	92.82	95.25	7	95.00	96.74
6	90.61	93.68	6	92.86	95.28	6	95.03	96.77
5	90.65	93.70	5	92.90	95.30	5	95.07	96.79
4	90.69	93.73	4	92.93	95.33	4	95.10	96.81
3	90.73	93.76	3	92.97	95.35	3	95.13	96.84
2	90.77	93.79	2	93.01	95.38	2	95.17	96.86
1	90.80	93.82	1	93.04	95.40	1	95.20	96.89
0	90.84	93.84	0	93.08	95.43	0	95.23	96.92
.8199	90.88	93.87	.8139	93.11	95.45	.8079	95.27	96.95
8	90.92	93.90	8	93.15	95.48	8	95.30	96.97
7	90.95	93.92	7	93.19	95.50	7	95.34	97.00
6	90.99	93.95	6	93.22	95.53	6	95.37	97.02
5	91.03	93.98	5	93.26	95.55	5	95.41	97.04
4	91.07	94.03	4	93.30	95.58	4	95.44	97.07
3	91.11	94.06	3	93.33	95.60	3	95.48	97.09
2	91.14	94.09	2	93.37	95.63	2	95.51	97.11
1	91.18	94.11	1	93.41	95.65	1	95.55	97.14
0	91.22	94.11	0	93.44	95.68	0	95.58	97.16

Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.		Specific Gravity at 60°F.	Absolute Alcohol, per cent.	
	By Weight.	By Volume.		By Weight.	By Volume.		By Weight.	By Volume.
*8069	95.62	97.18	*8019	97.34	98.33	*7969	99.02	99.39
8	95.65	97.21	8	97.37	98.35	8	99.05	99.41
7	95.68	97.23	7	97.40	98.37	7	99.08	99.43
6	95.72	97.25	6	97.44	98.39	6	99.12	99.45
5	95.75	97.28	5	97.47	98.41	5	99.15	99.47
4	95.79	97.30	4	97.50	98.44	4	99.18	99.49
3	95.82	97.32	3	97.54	98.46	3	99.22	99.52
2	95.86	97.35	2	97.57	98.48	2	99.25	99.54
1	95.89	97.37	1	97.61	98.50	1	99.29	99.56
0	95.93	97.39	0	97.64	98.52	0	99.32	99.58
*8059	95.96	97.42	*8009	97.68	98.55	*7959	99.35	99.60
8	96.00	97.44	8	97.71	98.57	8	99.39	99.62
7	96.03	97.46	7	97.75	98.59	7	99.42	99.64
6	96.07	97.49	6	97.78	98.61	6	99.46	99.66
5	96.10	97.51	5	97.81	98.63	5	99.49	99.68
4	96.14	97.53	4	97.85	98.66	4	99.52	99.70
3	96.17	97.56	3	97.88	98.68	3	99.56	99.72
2	96.21	97.58	2	97.91	98.70	2	99.59	99.74
1	96.24	97.60	1	97.95	98.72	1	99.63	99.76
0	96.28	97.63	0	97.98	98.74	0	99.66	99.78
*8049	96.31	97.65	*7999	98.02	98.77	*7949	99.69	99.80
8	96.35	97.67	8	98.05	98.79	8	99.73	99.82
7	96.38	97.70	7	98.08	98.81	7	99.76	99.84
6	96.42	97.72	6	98.12	98.83	6	99.79	99.86
5	96.45	97.74	5	98.15	98.85	5	99.82	99.88
4	96.49	97.77	4	98.18	98.88	4	99.85	99.90
3	96.52	97.79	3	98.22	98.90	3	99.88	99.92
2	96.56	97.81	2	98.25	98.92	2	99.91	99.94
1	96.59	97.84	1	98.28	98.94	1	99.94	99.96
0	96.63	97.86	0	98.32	98.96	0	99.97	99.98
*8039	96.66	97.88	*7989	98.35	98.98	*7939	100.00	100.00
8	96.70	97.91	8	98.39	99.00			
7	96.73	97.93	7	98.42	99.02			
6	96.77	97.95	6	98.45	99.04			
5	96.80	97.98	5	98.48	99.06			
4	96.84	98.00	4	98.52	99.08			
3	96.87	98.02	3	98.55	99.10			
2	96.90	98.04	2	98.58	99.12			
1	96.94	98.06	1	98.62	99.14			
0	96.97	98.08	0	98.65	99.16			
*8029	97.00	98.11	*7979	98.68	99.18			
8	97.04	98.13	8	98.71	99.20			
7	97.07	98.16	7	98.75	99.22			
6	97.10	98.18	6	98.78	99.24			
5	97.14	98.20	5	98.81	99.27			
4	97.17	98.22	4	98.85	99.29			
3	97.20	98.24	3	98.88	99.31			
2	97.23	98.26	2	98.91	99.33			
1	97.27	98.28	1	98.95	99.35			
0	97.30	98.30	0	98.98	99.37			

An Antidote to Strychnia.—From some observations of Professor Cervello ("Arch. Scie. Med., vol. ii, No. 1), it seems that paraldehyd possesses properties antagonistic to strychnia. Thirty-seven and a half grains of the former completely antagonized $\frac{1}{2}$ of a grain of nitrate of strychnia given to a rabbit. The converse action does not seem to exist, for strychnia has no influence on paraldehyd narcosis.—*Med. and Surg. Reporter.*

THE STEAROPTEN OF OIL OF PATCHOULY.

BY HENRY C. C. MAISCH.

Read at the Pharmaceutical Meeting, January 15, 1884.

Patchouly camphor, a homologue of borneol, as obtained from the oil is in pieces of various size and form, mostly belonging to the hexagonal class of crystals. The color ranged from light yellow, probably from adhering or enclosed oil, to colorless.

In order to purify the camphor, it was dissolved in alcohol. This solution did not crystallize although evaporated to a syrupy consistency. The alcohol was completely driven off, and the residue dissolved in ether, from which solution it deposited after several times recrystallizing in colorless truncated hexagonal prismatic crystals.

The fusing points of both the crude and the recrystallized camphor were determined. A small quantity was put on some mercury in a beaker glass in which a thermometer was suspended, the mercury covering the bulb. A slow heat was then applied, the mercury in the thermometer rising slowly. The melting point of the recrystallized camphor was found between 55° and 56°C. , coming near that determined by Gal in 1869 ("Compt. Rend.," lxxviii, 406), who gives it as $54\text{--}55^{\circ}\text{C.}$, while another author, de Montgolfier ("Ber. Deutsch. Chem. Ges.," 1877, 374), gives it as 59°C. The melting point of the crude camphor, determined upon mercury as stated above, was found between $57\text{--}58^{\circ}\text{C.}$, or about 2°C. higher than that of the recrystallized. The latter again solidified when cooled to between 48° and 49°C. , but the congealing point for the crude camphor is between 54° and 55°C. The boiling point determined by Gal, is given at 296°C. , the specific gravity as 1.051 at 4.5°C. , and the vapor density as 8.00 at 324°C.

Both authors above mentioned, have determined the formula, Gal giving it as $\text{C}_{15}\text{H}_{28}\text{O}$, and de Montgolfier $\text{C}_{15}\text{H}_{26}\text{O}$. Further experiments have shown that in the solid state the camphor has no effect on the plane of polarization while in liquid state it is levorotatory. By distillation over zinc chloride and by the action of anhydrous hydrochloric acid, boiling acetic acid and acetic anhydride one molecule of water is set free giving $\text{C}_{15}\text{H}_{24}$ or $\text{C}_{15}\text{H}_{26}$ respectively, a liquid hydrocarbon, which boils at about 250°C. , and at a slightly higher temperature is converted into polymeric hydrocarbons. Gal also found the oil left after the crystallization of the camphor, to distil over almost

completely at 282°–294°C. to have the same composition and to yield the same products as the camphor. In 1863 J. H. Gladstone ("Jour. Chem. Soc.") ascertained the rotation of different samples of the oil of patchouly to vary between 0 and—120°.

OLEUM BETULÆ LENTÆ.

BY GEO. W. KENNEDY, PH.G.

Read at the Pharmaceutical Meeting, January 15, 1884.

In a paper on this subject, read at the last meeting of the American Pharmaceutical Association, I stated that I had considerable correspondence with distillers in reference to the manner of extracting the oil and to the details of the process. After the analysis made by Mr. Pettigrew ("Amer. Jour. Phar.," 1883, page 385), in which he failed to find a terpene in oil of birch, and maintained that on this account it was not identical with oil of teaberry, Prof. Maisch suggested to me in conversation that perhaps the hydrocarbon was lost in the distillation of commercial oil of teaberry either by carelessness or through ignorance of the distiller, or by some defect in the process of extracting it. I immediately put myself in communication with several manufacturers for the sole purpose of ascertaining from them full particulars, more particularly as to the separation of a light oil floating on the surface of the distillate. The replies to these communications, excepting one or two, were alike. To the first interrogation, as to the process of extracting the oil, I find the *modus operandi* to be very much the same; there is little or no difference. To the second inquiry, as to the separation of a light oil, with one or two exceptions I was informed that this was of frequent occurrence, had been noticed by them for a long time, and was known in the birch fields by the names of "light ring" and "light oil." I was also informed that no care was taken to secure it, as it was considered worthless, of no value whatever, and that it was allowed to run off over the receiving vessel (see "Amer. Jour. Phar.," 1882, page 49).

After such strong proof from the distillers, and similar assurance from two reliable pharmacists, who handle hundreds of pounds of the oil, with whom I was in communication, I came to the conclusion that—provided the oil was properly and carefully extracted—it would

contain a hydrocarbon, and it was owing to this strong evidence that, at the Washington meeting, I unhesitatingly said that there was no reason why the oil should not contain the terpene. I believe, under the circumstances, I was justified in so speaking. The interesting discussion which followed the reading of my paper threw out suggestions which caused me to make further investigations.

It was my intention to spend several days in the birch woods, as I had invitations extended to do so, and witness the process of distillation more critically than I did on former occasions, but I was unable to fix a time to suit the convenience of all parties interested, owing to the small amount of oil made. During the past few months the stills were not in operation, the price of the oil being too low to compensate the distillers for their labor. However, my friend Mr. C. M. Briggs, a pharmacist of Carbon county, to whom I am much indebted for many favors, spent a day at one of the best stills in the region, which is worked by a man who thoroughly understands his business, and he obtained for me the product of the distillation of 600 pounds of material, which I here exhibit. The large jar (Mason's fruit jar) contains the oil just as it was made, with some water and dirt. Owing to an accident, about six ounces of the oil were lost. The yield was about one pound, or one-sixth of one per cent., which was small. The amount of "milk" (or water impregnated with oil), condensed in the exhaustion of the bark, amounts to 30 gallons. The jar was used as the receptacle for the oil, and was placed in a pail; as the pail fills with the "milk" it is emptied into a barrel, and put away to be used for another "run," as it is called, meaning the next distillation. The bottle labeled milk is a sample of the product nearing the close of the distillation. When received it was quite milky, but now the oil has separated, and of course the milkiness has disappeared, but by agitation it can be restored; the oily globules of a dirty color can be seen at the bottom of the vial. The "milk" contains about 2 ounces of the oil in every 25 gallons. The pieces of birch exhibited have had the oil taken out, and will give an idea as to the size of the pieces used in the extraction of the oil.

There was also another bottle received by the writer, marked "unknown," and said to contain "light oil," or "light ring," exclusively, and which, from previous information received, was considered to be a hydrocarbon. The vial contained $4\frac{1}{2}$ fluidounces, which was reported to me as having been skimmed from five pounds of oil before

it was rectified, or just as it came from the still; it was in two layers, and decidedly dirty, the layers occupying about an equal space in the bottle. After freeing it from dirt, by straining through flannel, the layers were separated, and upon examination the light upper layer was found to be nothing but water impregnated with oil. Its specific gravity at 70°F. is 1.001. The lower layer proved to be the oil, the specific gravity of which was taken, and found to be the same as that examined last year, 1.181 at 70°F., thus indicating that it was principally methyl salicylate. This oil was next submitted to a chemical analysis in the same manner as described by Mr. Pettigrew: 50 grams of the oil were decomposed with 25 grams of potassium hydrate, by boiling for six hours upon a sand-bath; at the expiration of this time the oil was perfectly decomposed, and, upon cooling, crystals of salicylate of potassium were obtained, and a clear distillate, without oily layer, nor was such produced upon dilution with water. This observation manifested conclusively the absence of a hydrocarbon. To get at the percentage of salicylic acid and methyl alcohol was the next step taken. The salicylate of potassium, formed as indicated above, was decomposed by hydrochloric acid, which liberated the salicylic acid in small whitish crystals, requiring only to be drained and subsequently recrystallized from ether. The amount obtained from 50 grams of the oil was 40 grams, or about 80 per cent. Another bottle, presented herewith and marked "impure," contains the acid as it is set free from the potassium salt. This was obtained from an old oil, made last year, and has not been recrystallized.

I then proceeded to obtain the methyl alcohol from the oil decomposed as described; the liquid portion was distilled from a sand-bath, until one-fourth the entire amount had passed over; this was redistilled, obtaining one-fourth as before, and this product, to get rid of the water, was distilled twice from lime. The methyl alcohol thus obtained, which is also shown, approximates $8\frac{1}{2}$ grams, or 17 per cent. This added to the acid yield would still leave a discrepancy of 3 per cent. to be accounted for.

The rectification (as it is termed) of the oil, to which I referred a year ago, is accomplished by simply straining or filtering through cotton and flannel.

The yield, as I have already stated, from the distillation made Dec. 26, 1884, was small; it required $7\frac{1}{2}$ hours' time to make the pound obtained. In the spring, when the sap is in the trees, the yield is from

25 to 35 per cent. larger, and the time consumed one to two hours less.

In concluding this paper I would state that I have endeavored to get all the information it was possible for me to obtain; also, that if all the "light oil" or "light ring" is like that examined by me, there should be no difficulty in giving it a name. The two samples of oil examined, of which one was a year and the other but a few days old, contained no terpene, and the result agrees with Mr. Pettigrew's observation, that oil of birch is nearly pure salicylate of methyl. The "light oil," so called by distillers, is shown to be water and oil; if the chips and dirt were removed from the distillate the oil and water would readily separate.

NOTES ON THE EXPANSION OF URINE BY INCREASE OF TEMPERATURE.

BY A. B. LYONS, M.D., Detroit, Mich.

In order that an observation of the specific gravity of urine shall be of any value, either the experiment must be made always at the same temperature, or else, the actual temperature being noted, an arbitrary correction must be applied. In clinical practice the first alternative involves difficulties not easily surmounted, and most physicians would prefer to adopt the second. Unfortunately, however, their textbooks are either silent altogether as regards the amount of the correction, or else the positive statements made by one authority contradict those of another. Thus Neubauer and Vogel state that according to the observations of Siemon the specific gravity of a urine which at 12°C. was 1.021, at 15°C. sank to 1.020, and at 18°C. to 1.019, so that a difference of temperature of 3°C. corresponds to about one degree of the urinometer. Beneke, they add, arrived at the same results. Witthaus probably quotes the same authority when he says (*Manual of Chemistry*, p. 5): "In a complex fluid like the urine a correction for temperature can be made roughly by allowing 1° of specific gravity for each 3°C. (5.4° Fahr.) of variation in temperature." Dr. Squibb, in the September "*Ephemeris*," makes a similar statement. Dr. Golding Bird, on the other hand, makes a correction of only about one-half this amount, *i. e.*, between 60° and 71°F., of one degree of the urinometer, and between 71° and 81°, of the same

amount. In view of these discrepancies, and of the improbability that the correction should be so large as stated by Neubauer and Vogel, I thought it worth the while to make an experimental test of the matter, and I have embodied the results of my observations in the accompanying tables. The figures represent the apparent specific gravities, as taken with an instrument adjusted to a temperature of 60°F., the unit of comparison being water at that temperature. For practical purposes the correction should be deduced from apparent and not actual specific gravities; otherwise there will be not one but several corrections to be applied to the figures obtained by observation.

TABLE I.—*Apparent Specific Gravity of Urine observed at Temperatures from 50° to 95° F., Water at 60° F. = 1·0000.*

Temperature. Fahr.	Specimen, No. 1.	Specimen, No. 2.	Specimen, No. 3.	Specimen, No. 4.	Specimen, No. 5.	Specimen, No. 6.
50°.....				1·02315		1·02485
55°.....	1·01305	1·02075	1·0223	1·0226	1·0230	1·0235
60°.....	1·0124	1·0203	1·02175	1·0221	1·0226	1·02295
65°.....	1·0119	1·0198	1·0212	1·0215	1·0221	1·02235
70°.....	1·0114	1·01915	1·0204	1·0209	1·0215	1·02155
75°.....	1·01075	1·01845	1·0197	1·02025	1·0208	1·02085
80°.....	1·0101	1·0177	1·0190	1·0195	1·0201	1·0201
85°.....	1·0094	1·01685	1·0181	1·0187	1·0194	1·0193
90°.....	1·0087	1·0160	1·0172	1·0179	1·0186	1·0184
95°.....	1·0080	1·01515	1·0162			

Temperature. Fahr.	Specimen, No. 7.	Specimen, No. 8.	Total correction (average).	Average correction for 1°F.	Solution of common salt.	Distilled water (apparent)
50°.....	1·0267	1·0285	—·00105	·000105	1·0630	1·00050
55°.....	1·0261	1·02745	—·00054	·000108	1·0625	1·00028
60°.....	1·0255	1·02605	+·00000	.....	1·06192	1·00000
65°.....	1·0249	1·02645	+·00057	·000114	1·0612	·99956
70°.....	1·0242	1·0258	+·00122	·000122	1·0604	·99912
75°.....	1·0235	1·0251	+·00190	·000127	1·05955	·99861
80°.....	1·0228	1·0244	+·00263	·000131	1·0586	·99797
85°.....	1·0221	1·0236	+·00342	·000137	1·05765	·99732
90°.....	1·0214	1·0227	+·00424	·000141	1·05665	·99657
95°.....	1·0206	1·0218	+·00509	·000145	.....	·99476

TABLE II.—*Apparent Specific Gravity of Urine observed at Temperatures from 10° to 35° C., Water at 15° C. = 1·0000.*

Temperature. Cent.	Sample, No. 1.	Sample, No. 2.	Sample, No. 3.	Sample, No. 4.	Sample, No. 5.	Sample, No. 6.
10°.....	1·0299	1·0280	1·0267	1·0231	1·0235	1·0212
15°.....	1·0290	1·0271	1·0256	1·02215	1·0227	1·0203
20°.....	1·02175	1·0260	1·0245	1·02115	1·02185	1·01935
25°.....	1·0205	1·02485	1·0233	1·0200	1·02055	1·01815
30°.....	1·0189	1·0234	1·0220	1·0186	1·0192	1·01675
35°.....	1·0170	1·0218	1·0206	1·01715	1·0177	1·01525

Tem- perature. Cent.	Sample, No. 7.	Sample, No. 8.	Sample, No. 9.	Total correction (average).	Average correction for 1° C.	Sp. gr. of solution of common salt.	Sp. gr. (apparent) of water.
10°.....				—·0002	·000185	1·0630	1·00058
15°.....	1·0205	1·0212	1·01255	·00000	.....	1·0620	1·00000
20°.....	1·0195	1·0207	1·0116	+·00101	·000202	1·06065	·99938
25°.....	1·0184	1·0194	1·01065	+·00220	·000220	1·0592	·99837
30°.....	1·0171	1·0180	1·0094	+·00358	·000239	1·0575	·99713
35°.....	1·0156	1·0162	1·0080	+·00514	·000257	1·0558	·99566

A study of the above figures will show that Neubauer and Vogel have given too large a correction, while Golding Bird has given one too small. As might be expected, different specimens of urine show different expansion, even when the density is about the same, and the variation is curiously capricious, sometimes being greater between 50° and 60° than between 60° and 70°F. On the whole, however, the expansion becomes more rapid as the temperature rises, so that a larger arbitrary correction should be made for temperatures above 77°F. than for those below that figure.

An average correction sufficiently exact for practical purposes would be for temperatures below 75°F. one degree of the scale of the urinometer (=·001) for 8½°F., or nearly 5°C.; for temperatures above this, one degree of the urinometer for 7¼°F., or about 4°C.

Thus, if the temperature is 70°F., and the reading of the urinometer 1·022, the correction for 10° will be $10 \div 8\cdot5 = \cdot0012$ nearly, and the corrected specific gravity will be $1\cdot022 + \cdot0012 = 1\cdot0232$.

If at 85° the reading of the urinometer be 1·019, a correction must be made for 25°F., which will be $25 \div 7\cdot25$, or about ·0035, and the corrected specific gravity will be 1·0225.

From the tables more exact figures may be obtained, but different specimens vary so greatly that when great exactness is required the specific gravity should be taken at the standard temperature.

It is possible that peculiarities in the diet and the habits of different individuals and of different nationalities may produce constant differences in the physical characteristics of the urine as affected by temperature, and it is to be hoped that other observers will make a study of this matter, and report results for comparison. The figures obtained in my own observations agree very well with what we might expect from the composition of the fluid under consideration. I have added to the table, for comparison, the specific gravities respectively of pure water and of a solution of common salt, taken at the same temperatures as the specimens of urine. It will be observed that both the saline fluids expand much more rapidly, especially at the lower temperatures, than pure water.

ON THE ACTION OF AMMONIUM CHLORIDE UPON LEAD IODIDE.

BY HENRY C. C. MAISCH.

Read at the Pharmaceutical Meeting, January 15, 1884.

The Pharmacopœia of 1880 gives as a test for the purity of lead iodide the following: "On triturating 1 part of the salt with 2 parts of chloride of ammonium in a porcelain mortar, and adding 2 parts of water, a colorless liquid should result (absence of and difference from chromate)."

This would give a solution of 3 parts of the mixed salts in 2 parts of water. On looking for the solubilities I find the Pharmacopœia to give for lead iodide 1 part in 2,000 parts at 15°C. (59°F.) and in 200 parts of boiling water, and for ammonium chloride 1 part in 3 parts at 15°C., and in 1·37 parts of boiling water. The combination of the salts would form, according to the pharmacopœial test, a compound soluble in 0·67 parts of cold water, or of about the same solubility as the deliquescent salts sodium iodide and potassium hypo-

phosphite, and more freely soluble than the deliquescent potassium carbonate.

The test of the Pharmacopœia was evidently copied from "Hager's Pharmaceutische Praxis," vol. 2, p. 741, but not without making a mistake in its rendition. A proper version from Hager follows: "If 1 part of lead iodide be triturated in a porcelain mortar with 2 parts of ammonium chloride, and 2 parts of water are added, decoloration must soon follow; otherwise the salt may possibly contain lead chromate."

If 2 grams of lead iodide be triturated in a mortar with 4 grams of ammonium chloride, transferred to a test tube, and 4 grams of water are added, a magma of a white or whitish color entirely free from any yellow tint, results, but not a solution, as stated by the Pharmacopœia. If heat be now applied the golden yellow color of lead iodide again makes its appearance and changes, on further application of heat, to a pale yellow or yellowish white before dissolving. This solution is of a brownish yellow color and deposits lemon-yellow ramifying crystals; if allowed to cool slowly, these are soon covered by pale yellow or white silky, fine, acicular crystals; but if rapidly cooled the latter crystals only form.

If to another mixture of the two salts in the same proportion with the same amount of water as above, 4 parts more of water are added, the golden yellow color of lead iodide makes its appearance at the point of contact. On heating this mixture to boiling the color changes to a greenish yellow, and before dissolving to a yellowish white as in the first experiment. On cooling, this solution deposits lemon colored crystals as in the other solution, which are soon covered by the white silky crystals as in the other solution. In both cases solution is not effected in the cold but only on heating.

If, as a third experiment, a small quantity of lead chromate is added to lead iodide, and the salt is then triturated with 2 parts of ammonium chloride and with 2 parts of water, the mixture becomes somewhat lighter in color. Now, on heating, this mixture only partly dissolves, leaving a brick-red precipitate with a brownish yellow solution. On cooling, crystals of a white color are formed on top of the precipitate.

Thinking it would be of interest to know something about the reactions which take place in the foregoing experiments, I looked through the literature on the subject. In Gmelin's *Inorganic Chemis-*

try four compounds are noticed which may be formed and the following information is given as to their formation, composition and properties :

Lead iodide is completely soluble in both hot and cold solutions of ammonium chloride. The hot solution on cooling deposits crystals having the formula $\text{NH}_4\text{Cl} \cdot \text{PbI}_2$ (Vöckel) and $(\text{NH}_4\text{Cl})_3 \cdot (\text{PbI}_2)$ ("Behrens, Pogg. Ann." lxii, 252). The first are described as yellowish white needles, the second as yellowish needles, having a beautiful silky lustre. The yellow acicular crystals, which are deposited from the hot solution, according to Poggiale, do not contain any ammonium chloride and have the formula $(\text{PbCl}_2)_2 \cdot \text{PbI}_2$. After concentration the mother liquor deposits white branching needles of a silky lustre, which contain ammonium chloride, become yellow on exposure to air, and are decomposed by water; their formula is $(\text{NH}_4\text{Cl})_4 \cdot \text{PbI}_2 \cdot 2\text{H}_2\text{O}$ ("Poggiale, Compt. Rend." xx, 1180.)

On applying the test as proposed by Hager and admitted by the Pharmacopœia, the change of the mixture in color from yellow to white is most likely due to the formation of lead chloride and ammonium iodide, both of which salts are white; possibly a double chloride may be formed, or a white double salt containing both iodide and chloride. On the application of heat the lead iodide is reproduced before it is dissolved with the formation of one or more of the above-mentioned double salts. A reproduction of lead iodide, either wholly or in part, also takes place on diluting the mixture with cold water.

The solubility of lead iodide in ammonium chloride was already observed in 1827 by Boullay ("Ann. Chim. Phys.," xxxiv). But Wittstein appears to have first studied the effect of ammonia and its salts upon lead iodide ("Buchner's Report.," 1838, liii, 322); he found that solutions of ammonium carbonate and sulphate change the yellow color of lead iodide rapidly to white, and that the same change though less rapidly, also takes place with ammonia and with ammonium nitrate and succinate. Very likely all freely soluble ammonium salts have the same effect.

The influence of ammonium salts upon lead chromate does not appear to have been the subject of investigation; at least I have found nothing in works of reference beyond the statement that chrome yellow is insoluble in ammonium chloride. This, as shown above, is correct; yet a notable change takes place on boiling with a solution of the latter salt, indicating the production of basic lead chromate or chrome red.

Before summing up I would like to call attention to a misplacement

in the table of solubilities of the Pharmacopœia (page 426) under the head of ammonium chloride; at present it reads: 1 part soluble in 3 parts of water at 15°C.; almost insoluble in boiling water; soluble in 1.37 parts alcohol at 15°C.; almost insoluble in boiling alcohol. In order to make it conform to the text under ammonium chloride it should read, 1 part soluble in 1.37 parts of boiling water, and almost insoluble in alcohol at 15°C.

The test of the Pharmacopœia for the absence of lead chromate from lead iodide should read about as follows: "On triturating 1 part of the salt (lead iodide) with 2 parts of chloride of ammonium in a porcelain mortar and adding 2 parts of water, the mixture should soon change to a white color and when heated should dissolve without residue."

THE PREPARATION OF PURE BENZOIC ACID FROM URINE.¹

BY T. S. DYMOND.

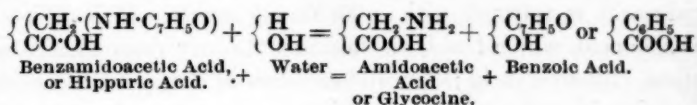
Contribution from the Research Fund of the School of Pharmacy Students' Association.

In the production of some glycocine from hippuric acid, for the confirmation of the reported synthesis of uric acid, the results of which investigation I partly brought before this Association last year, I obtained as a bye-product, benzoic acid. The preparation of benzoic acid in this way is interesting, because it is indirectly obtained from urine, hippuric acid being derived from that source, and because the use of such benzoic acid, which, as hitherto prepared, retains the odor of urine, is prohibited by British, German and United States Pharmacopœias. This being the case, I have made a few experiments to determine in what way benzoic acid thus obtained differs from that obtained from gum benzoin.

Preparation.—The commercial method of preparing benzoic acid from urine is by boiling putrid urine (which contains the hippuric acid in solution) with hydrochloric acid. A purer body will obviously be obtained at little more expense by first separating the hippuric acid, and this now is frequently done commercially. The phosphates in the urine taken are precipitated by lime. The urine is neutralized with hydrochloric acid, and evaporated to a low bulk. Strong hydrochloric

¹ Read at a meeting of the School of Pharmacy Students' Association, November 29, 1883.

acid is then added in excess, and the hippuric acid which separates is washed and recrystallized and sometimes further purified and decolorized. The purified hippuric acid is then heated with strong hydrochloric acid and the mixture kept at its boiling point till the hippuric acid has entirely disappeared and dark oily drops of benzoic acid have begun to form. On cooling and adding water the benzoic acid crystallizes out in the form of flattened plates, which are washed and dried.



Benzoic acid thus obtained has that peculiar urine-like odor which quite unfits it for use in medicine.

I have found, however, that when this impure acid is carefully sublimed, it can be obtained in a state of perfect purity and in beautiful crystals, which recrystallize from water in a form different from that in which the acid crystallizes before sublimation, but identical with that in which benzoic acid obtained from gum crystallizes.

Tests.—The only test in the British Pharmacopœia for benzoic acid is that of smell; benzoic acid is to have an agreeable aromatic odor resembling that of benzoin. As gum benzoin differs very much in smell, some specimens containing styrol, and others vanillin, while others have no particular odor, as the specimen of Palembang gum from the Museum of the Pharmaceutical Society, there is much commercial benzoic acid which does not answer to this test, and has not the aroma which it is understood gum benzoin should have.

In the German Pharmacopœia there are three tests. The acid is to have the smell of benzoin and also an empyreumatic odor, and is to be of a yellowish or yellow-brown color. This is to ensure the acid being prepared by direct sublimation of the gum. However, benzoic acid thus made, if the operation be performed with care and at a low temperature, may be quite colorless. It is a pity that the acid should be required to be contaminated, simply to prevent adulteration with acid obtained from other sources. In order to obtain it colorless a temperature of 160° C. is quite high enough for the sublimation of the whole of the acid. At first water and dark colored hydrocarbons volatilize together with some benzoic acid; these must be allowed to escape for two or three hours. The benzoic acid may then be collected,

a free outlet being always allowed for the less readily condensable vapors.

Before the end of the operation all these vapors will have passed away and the temperature may be raised even to 230° C. without any risk of contaminating the acid.

The second test is to prove the absence of cinnamic acid, and depends on the fact that the odor of oil of bitter almonds is evolved when cinnamic acid is warmed with an oxidizing agent. It is difficult to get benzoic acid, which has been sublimed directly from gum, always free from cinnamic acid; for all varieties of benzoin occasionally contain this acid, and sometimes it has been said no benzoic acid ('Pharmacographia'); and it is only by the lime extraction method that the cinnamic acid could be got rid of, as it sublimes in the same way as benzoic acid.

The third test is to prove the presence of volatile hydrocarbons, and depends on the fact that known quantities of styrol and vanillin and some other liquid hydrocarbons reduce a known quantity of solution of permanganate of potassium in a certain time. This test is also faulty, for if a few drops of permanganate solution be added to a crystallized solution of the impure urine-benzoic acid, decolorization occurs in a very short time, although no styrol or other aromatic hydrocarbon is present. Almost any organic matter, indeed, will effect this change.

The United States Pharmacopœia implies that benzoic acid must be made from benzoin by extraction with lime, for the acid is to be white and to have only a faint aromatic odor of benzoin. *It is not to have the smell of oil of bitter almonds or stale urine, thus preventing the use of benzoic acid prepared from toluene or from urine.

Two additional tests are given.

1. A solution of benzoic acid in pure cold sulphuric acid, when gently warmed, should not turn darker than a light brown. This is a good test for the absence of organic impurity.

2. Benzoic acid mixed with freshly ignited and moistened cupric oxide should not yield a green coloration to the flame when applied on a platinum wire. This test is meant to prove the absence of chlorobenzoic acid, which may occur as an impurity if the benzoic has been made from toluene. It must be performed with great care, for if the mixture be allowed to get too hot, the cupric oxide combines with the benzoic acid, and colors the flame an intense green. The mass then

must be kept moist. It will be seen from these tests that all the Pharmacopœias require that benzoic acid must be prepared from gum benzoin. The German Pharmacopœia directs that it is to be made by sublimation, have a yellowish-brown color, aromatic odor, and contain a substance (styrol?) capable of reducing potassium permanganate. Hence the benzoic acid of the German Pharmacopœia is not intended to be chemically pure. The United States Pharmacopœia indicates that it should be prepared by the lime method and be chemically pure. Urine-benzoic acid can never answer to the tests for the former, but when prepared by the method above described, it will be seen that it comes up to the standard imposed by the tests for the latter.

The following table shows how five specimens of benzoic acid compare with each other :

	Urine benzoic acid unsublimed.	Urine benzoic acid sublimed.	Benzoic acid extracted with lime from Palembang gum.	A commercial specimen of benzoic acid.	Benzoic acid sublimed from Fe-nang gum.
Solut'n in cold H_2SO_4 when warmed is....	Dark brown	Light brown	Light brown	Light brown	Dark brown.
Mixed with moist CuO gives in the flame.....	No green tinge.	No green tinge.	No green tinge.	No green tinge.	No green tinge.
Warmed with solution of $K_2Mn_2O_8$ gives.....	No odor.	No odor.	No odor.	No odor.	Smell of oil of bitter almonds.
A cold solution with $K_2Mn_2O_8$ becomes...	Colorless in 5 minutes.	Not colorless in 12 hours.	Not colorless in 12 hours.	Not colorless in 12 hours.	Colorless in 5 minutes.
Crystallizes from an aqueous solution in	Prismatic needles.	Flaky crystals.	Flaky crystals.	Flaky crystals.	Small needles
Odor	Like urine.	Faintly aromatic.	Faintly aromatic.	Disagreeably aromatic.	Strongly aromatic.

It would appear then that benzoic acid prepared from hippuric acid is totally unfit for use in medicine, unless it has been sublimed. When sublimed its character is entirely changed. Instead of crystallizing from water in large prisms, it does so in flaky crystals like the natural varieties. It has lost its offensive smell and has even a faint aromatic odor. It is purer than the acid obtained by direct sublimation of the gum, for it does not contain any volatile hydrocarbons, and solution of

permanganate of potassium was only decolorized after long standing. It is pure benzoic acid and is identical with the specimen of acid extracted by lime from Palembang benzoin.

From these experiments it will also be seen that the absence of urine-like odor in a sample of benzoic acid, and its conformity to the United States Pharmacopœia tests cannot be taken as indicating that it has not been prepared from urine.

My thanks are due to Mr. Holmes for the assistance he has given me in the identification of the resins, and to Mr. Dunstan for his suggestions and help while working in the Laboratories of the Pharmaceutical Society.—*Phar. Jour. and Trans.*, Dec. 15, 1883.

THE PREPARATION OF QUASSIIN.¹

BY ADRIAN AND MOREAUX.

Quassiin, the active principle of *Quassia amara* or Surinam wood, has long been presented in a more or less impure extractive form. The authors have studied the different published methods of extraction and have arrived at the conclusion that some of these methods give but a defective product, while the others, though producing purer quassiin, remove but a small portion of the bitter principle contained in the wood.

After quoting the methods for extraction given by Soubeiran, Pelouze, Wurtz, Wiggers, and Christiansen, the authors state that by the following process, which is their own, a purer and more abundant product is obtained.

Very sound wood reduced to thin shavings is exhausted by the aid of boiling distilled water, either by displacement or by decoction, carbonate of potash being added to the extent of 5 grams per kilogram of quassia. The liquor is then concentrated by evaporation, first by the open fire, afterwards in a water-bath, to the consistence of a soft extract; a mean of 60 grams per kilogram of quassia being obtained. The extract is afterwards suspended in hot 90° alcohol, and after standing a few moments the supernatant alcohol is decanted; the process being repeated a second and third time, so as to thoroughly exhaust the extract. The alcoholic liquor is allowed to stand twenty-four hours, during which it deposits extractive matter and salts dis-

¹ From the *Rép. de Pharm.*, n. s., vol. xi, pp. 246-250, (Juin, 1883).

solved by the hot alcohol; the liquid should then be decanted, and sulphuric acid diluted with ten times its weight of 90° alcohol added until a precipitate is thrown down, from 2 to 2½ grams being necessary for each kilogram of quassia. The liquor is then filtered, milk of lime added in the proportion of 12 to 15 grams per kilogram of wood (or 4 to 5 grams of caustic lime), and after some hours' contact, it is passed through muslin and the deposit washed with alcohol and pressed, as it is very spongy and contains much alcoholic liquor.

The liquor being alkaline after the treatment with lime it is neutralized by a current of carbonic acid, and then again filtered. Thus prepared the liquor has a light amber tint. It now remains only to distil the alcohol and to dry the residue from the distillation. Each kilogram of quassia yields by this process about 8 grams of a friable and easily pulverized product which is the amorphous quassiin of Adrian.

If, instead of amorphous, it be desired to obtain crystallized quassiin, the distillation should be stayed while there yet remains a small quantity of alcohol in the product, which is then poured boiling upon a moistened filter to separate the resin. This filter should be so placed that the liquor may be received in a porcelain capsule. The remainder of the alcohol is then evaporated by heating to 80°C., and as the alcohol volatilizes, the quassiin crystallizes out and is deposited. As soon as the liquor contains no more alcohol, it is withdrawn from the fire; when in a few minutes and before the liquor has quite cooled it forms a crystalline mass. When quite cold, the mother liquor is decanted and the crystals are washed several times with distilled water. The quassiin thus obtained is not quite pure; it still contains some resin and uncrystallizable quassiin. To purify it, it is dried, and then dissolved by heating it in twice its weight of 95° alcohol. It is then placed to crystallize in a funnel with a very short neck closed by a cork stopper; in cooling, the quassiin crystallizes, and after ten or twelve hours, forms a mass. The stopper is then removed and the alcohol, which has been used in crystallizing, is displaced by 90° or absolute alcohol, in order to wash the quassiin. As the crystallizing liquor draining away is replaced by fresh alcohol, the colored quassiin is seen to become white; a second crystallization suffices to render it very pure; the result is from 1¼ to 1½ gram per kilogram of quassia.

The mother liquor and the wash waters of the first crystallization

retain a considerable quantity of quassiin, which it is difficult to entirely extract. A large proportion may be obtained by shaking these liquors several times with chloroform, which dissolves the quassiin and separates very easily from the aqueous liquor. The chloroform is distilled off, and in this way the non-crystallizable quassiin is obtained, it being deposited from the alcoholic solution as a granular resinoid substance, which is very easily softened by heat. Its bitterness is nearly equal to that of the crystallized quassiin. Repeated treatments with chloroform have failed to remove from the aqueous solution the whole of this quassiin, which seems to be combined with mineral salts that it still contains.

The alcohol which has been used in the crystallization, as well as that used in the washing, contains also in solution a little quassiin both crystallizable and uncrystallizable, which may be obtained by the same process as above described.

Résumé.

	Crystallizable quassiin.	Uncrystallizable quassiin.	Mineral salts.	Resin and other organic matters.
Viscous brown amorphous quassiin, in 100 parts, contains,	00 to 00	12 to 15	35 to 40	45 to 50
Yellow amorphous quassiin, in powder, contains, in 100 parts.....	18 to 20	18 to 20	25 to 30	30 to 35

In brown quassiin, potassium salts predominate.

In yellow quassiin, calcium salts.

Crystallized quassiin is white, light, very soluble in chloroform, soluble in about 90 parts of cold absolute alcohol, in 35 to 40 of 80° alcohol, scarcely soluble in ether, and soluble in about 300 parts of hot water, from which it recrystallizes on cooling.

Uncrystallizable quassiin is very soluble in absolute alcohol, more soluble in ether than crystallized quassiin, and less soluble in water.—*Phar. Jour. and Trans.*, Dec. 29, 1883.

Succinate of Iron in Biliary Colic.—Dr. Jas. A. Stewart, of Baltimore, revives the claim that the hydrated succinate of the peroxide of iron is efficient in the treatment of gall-stones. He reports one case in which a patient, a lady of forty, who had suffered for three months and was greatly emaciated, recovered health rapidly under drachm doses of the succinate. There had been no trouble for two years.—*Louisv. Med. News*.

TINCTURE DEPOSITS.¹

BY R. A. CRIPPS.

Contribution from the Research Fund of the School of Pharmacy Students' Association.

Every pharmacist must have noticed the fact that most of his tinctures, after having been filtered, deposit sooner or later a more or less bulky sediment. The importance of knowing the nature of these deposits at once suggests itself to every one. Is it that they contain some of the active principles of the drugs, or are they only gummy or albuminous matter, of no value in medicine? It is with the view of throwing some light upon this question that I have undertaken their investigation, feeling that my work, however imperfect, will be one step towards a deeper knowledge of the chemistry of some of the pharmacist's practical difficulties.

1. *Tinctura Calumbæ*.—The deposit in this tincture usually occurs in flaky pieces of a light olive-brown color, mixed with a gummy-looking substance of the same nature. Under the microscope the sample under examination formed a very interesting object, as it consisted principally of finely-formed starch granules, similar to a mixture of arrowroot and wheat starches, showing very distinctly the hilum and concentric rings, and with the polariscope a fine black cross; with the starch was mixed a quantity of matter of no definite structure, and a few very fine tubular vessels of a bright yellow color.

The starch was confirmed by adding iodine to the cooled decoction of the deposit, when the usual blue color was developed.

After washing well with proof spirit (until the washings passed nearly colorless) the deposit was boiled with water, and afterwards with very dilute sulphuric acid; it gave a brownish-yellow solution, which on dilution with spirit, boiling and addition of dilute solution of iodine in iodide of potassium, gave no green spangles indicative of berberine, nor did it possess any markedly bitter taste, showing the absence of more than traces of colombin or colombic acid.

The deposit in tincture of calumba may therefore be said to contain none of the active principles of the drug, and, except for the inconvenience of filtering, is of no consequence.

¹ Read at a meeting of the School of Pharmacy Students' Association, Nov. 29.

Tinctura Cardamomi Composita.—This deposit occurs principally in minute crystals of a dirty white color, with a small proportion of a flocculent substance. The crystalline form is well shown by a low power of the microscope, which reveals several different forms, a few octahedra, while others are hexagonal prisms with pyramidal apex and base, besides others more difficult to make out.

The deposit was first washed with proof spirit until the washings passed colorless or nearly so, then boiled with water and filtered. The filtrate was examined for metals, very carefully for potassium, and also for tartaric acid, but gave no evidence of the presence of either, proving that the deposit is not acid tartrate of potassium, as I think is the usual opinion.

The precipitate was then boiled with a strong solution of sodium carbonate for about three hours and filtered. The insoluble portion was examined for metals, *calcium* was alone found.

Looking at the constituents of the tincture I find that the deposit must consist of one or more of the following:—Tartrate or malate of calcium or oxalate of calcium.

The alkaline filtrate was therefore divided into four portions. To the first was added excess of solution of acetate of lead, the precipitate filtered off and dried upon a water-bath, ammonia added again dried, then a few more drops of ammonia, and lastly digested with alcohol, which would dissolve any malate of ammonium if present; on evaporation of the alcoholic solution no residue was obtained, proving absence of malate of calcium.

To the second portion excess of acetic acid was added, then solution of calcium chloride; no precipitate was formed, showing absence of oxalate of calcium.

To the third portion nitric acid was added to exact neutrality, a slight excess of nitrate of silver, and lastly ammonia in slight excess; on boiling for a short time a fine mirror of silver was obtained on the sides of the tube, giving strong suspicion of tartaric acid.

To the fourth portion were added excess of acetic acid, a little potassic hydrate, then more acetic acid (to ensure acidity), and lastly a small quantity of alcohol. On setting aside for a short time a white crystalline precipitate formed, which on the addition of strong sulphuric acid and gently warming gave off the odor of burnt sugar, indicating the presence of *tartaric acid*.

A small portion of the original aqueous solution was boiled with

Fehling's solution, but gave scarcely any evidence of sugar, probably not more than due to adherent tincture. The deposit in tr. card. co. is therefore almost entirely tartrate of calcium.

Tinctura Chloroformi Composita, B.P.—As might be expected, this deposit is the same as that occurring in tinct. cardam. comp.

Tinctura Cinchonæ Composita, B.P.—This deposit was of a dark reddish brown color, and in a state of very fine division, not at all aggregated into lumps or scales. 1.769 gram was treated as described further on under tinct. cinchonæ flav., and yielded .0542 of a gram or 3.064 per cent. of total alkaloids. The acid solution of alkaloids was scarcely fluorescent, and gave only a faint green coloration with bromine and ammoniac hydrate, indicating only traces of quinia or quinidia. A saturated solution of the sulphate, when shaken with half its volume of ether and excess of ammonia, afforded abundant evidence of the presence of cinchonina.

The coloring matter of cochineal was also present, as shown by the color imparted to dilute HCl on boiling with the deposit, and by the addition of sulphate of zinc and ammoniac hydrate in excess, when a fine violet tint was developed; ammoniac hydrate alone giving a deep claret coloration.

The presence of cochineal entirely masked any reactions for cinchonated which may have occurred.

Ferric chloride gave a faint reaction for cinchotannic acid.

The deposit was found to contain 3.064 per cent. of alkaloids, chiefly cinchonina, probably existing as cinchotannates; and a little coloring matter from the cochineal.

Tinctura Cinchonæ Flavæ, B.P.—Three samples of this deposit were examined, they varied much in appearance and nature.

First sample.—This was of a brown color. Being in small quantity only it was simply tested for the presence quinia and other alkaloids. It was well washed with proof spirit, to free it from adherent tincture, dried and mixed with milk of lime, thoroughly dried over a water-bath and extracted with chloroform. The chloroformic solution was shaken with dilute sulphuric acid (to dissolve out alkaloids as sulphates) and washed with water till free from bitterness. The acid solution of alkaloids thus obtained was shaken with chloroform and ammonia in slight excess, and the chloroformic solution separated and evaporated to dryness.

The residue which consisted of the pure alkaloids was now tested

for quinia. 1st. By dissolving a little in dilute H_2SO_4 , adding bromine water and then ammoniac hydrate. A fine green coloration, due to thalleioquin appeared. 2d. The remaining alkaloid was dissolved in a small quantity of hot dilute H_2SO_4 , exactly neutralized with ammoniac hydrate, still being kept hot, and set aside for a short time. An abundant supply of crystals appeared, showing the presence of quinia.

Second sample.—This sample was much lighter in color than the other two, and far larger in proportion to the amount of tincture from which it separated. It was first examined quantitatively for alkaloids and for quinia. 7.237 grams were treated as above, the extraction with chloroform being performed in a "Dunstan and Short's apparatus for continual extraction," which I find by far the best for the purpose. After evaporation of the chloroformic solution the residue was dissolved in dilute H_2SO_4 , heated upon a water-bath, exactly neutralized by AmHO and set aside to crystallize, filtered, well drained, and again dissolved in boiling water, set aside, the crystals collected, drained, dried at $100^\circ C$. and weighed. 0.156 of a gram was obtained, to which was added 0.0876 of a gram, being the amount of quinia sulphate retained by the mother liquors, equivalent to 2.94 per cent. of quinia, or 3.204 per cent. of crystalline sulphate of quinine. The mother liquors were now precipitated by ammonia and the alkaloids taken up by chloroform, which solution, on evaporation, yielded .3182 of a gram of alkaloids, from which was deducted .0697 of a gram (the quinia present) leaving .2485 of a gram of alkaloids, not quinia, or 3.433 per cent.

The deposit, therefore, contains—

Total alkaloids.....	6.374 per cent.
Quinia.....	2.940 per cent.

Cinchotannic acid was proved by distilling the dry deposit, when an odor resembling carbolic acid was developed, and the distillate when tested with bromine water gave a white precipitate which rose to the surface of the liquid (tribromophenol); and by the slightly acid extract giving a faint greenish coloration with ferric chloride. Cinchona-red was proved as below.

Third sample.—This was of a very dark color, having the appearance of cinchona-red. 1.35 gram was treated as before for alkaloids. The yield was only .034 of a gram or 2.52 per cent. The solution was only faintly fluorescent. On attempting to crystallize out the

quinia as sulphate, I succeeded in getting only a few very minute crystals, quite insufficient to weigh; and on testing for quinia by the thalleioquin test, I obtained only a faint reaction. A saturated solution of the sulphates, when mixed with half its volume of ether and excess of ammoniac hydrate, afforded abundant evidence of the presence of cinchonidine.

Cinchotannic acid was proved as before.

Warmed with potassic hydrate or acetic acid it imparted a deep brown-red color to the solution, due to cinchona-red.

From these three examples it will be seen that the deposit contains a very varying amount of alkaloids, and although the two latter were from tinctures prepared strictly according to the B.P. (the first I am not certain of), their nature both physically and chemically was very different.

Tinctura Ferri Acetatis.—This was washed with water; the first washings were found to contain free acetic acid. The deposit was then dried and weighed = .1833 of a gram, dissolved in diluted HCl, diluted, and the iron precipitated in the usual manner by AmHO. The precipitate, after washing and drying, weighed .1279 of a gram, that is to say, the deposit represents 69.77 per cent. of oxide of iron, Fe_2O_3 .

Ferric oxyacetate, $\text{Fe}_6\text{O}_7(\text{C}_2\text{H}_3\text{O}_2)_4$ represents 70.175 per cent. of ferric oxide.

Tinctura Gentianæ Composita.—This deposit was of a grey color, and was mixed up with tow. It was first washed with proof spirit until the washings passed colorless or nearly so. Examined microscopically it was seen to consist mostly of very small starch granules, about the size of rice starch, but oval rather than angular. Some of the deposit was then gently boiled with water, cooled and solution of iodine added; a greenish-blue color appeared, confirming the presence of starch. It was then washed with cold water, and the washings filtered and evaporated to dryness over a water-bath. The residue was nearly white and possessed no bitter taste, proving absence of gentiopicrotin. Portions were then tested as follows:—1st. A small quantity was boiled with potash solution, a yellow color was produced. 2d. Another portion was tested with Fehling's solution, which it quickly reduced. 3d. To a drop of solution of borax was added one drop of solution of phenol-phthalein, and then a few drops of the aqueous solution of residue. The pink color was not discharged. The

first two experiments show that the residue was sugar, and the last that the sugar of gentian is not a polyhydric alcohol, such as glucose.¹ In order to prove that this was the same sugar as exists ready formed in the root, I prepared a decoction of gentian, filtered, and tested as before with phenol-phthalein and borax; obtaining the same results. The remainder of the deposit was washed with strong, hot alcohol, and the alcoholic solution evaporated to dryness. The residue was too minute for examination, but had the appearance of an oily resin, which formed a yellow solution with caustic potash. It had no bitter taste. After washing with alcohol the residue consisted of albuminous matters and starch mixed with tow. Starch and gentian sugar, mixed with albuminous matter, are, therefore, the constituents of the deposit of tinct. gent. co., the first having no doubt slipped through the filter, as starches frequently will.

Tinctura Ipecacuanhæ Concentrata.—This is not an official tincture, but as it is somewhat largely used in some parts of the country, I have examined it qualitatively for emetine. After washing with weak spirit, it was dried, mixed with milk of lime and again dried, warmed with chloroform, the solution filtered and evaporated on a water-bath. Scarcely any residue was left, and on treating with calcium hypochlorite and acetic acid no yellow color was produced, indicating absence of emetine.

Tinctura Lobeliæ Inflatæ Ætherea.—This deposit occurred as a somewhat flaky, white sediment; it does not occur in the tincture made with proof spirit.

It was first washed with spirit of ether, and shaken up with water, the aqueous liquid tested by Mayer's reagent for the presence of alkaloid, but found to contain none, and on boiling the deposit with water no odor of lobeline was developed, even on the addition of ammoniac hydrate. After boiling, the deposit assumed a resinous appearance, and was of a greenish-white color. Some of this resin (?) was treated with caustic potash, but was insoluble; it dissolved perfectly in ether, from which solution it was precipitated by alcohol as a nearly white resin (?). Benzol, chloroform, and bisulphide of carbon also dissolved it freely. It gave no characteristic reaction with any of the ordinary reagents for resins.

Tinctura Quiniæ.—The sample of tincture from which this deposit

¹ See *Pharm. Journ.* [3], vol. xiv., p. 41; Dunstan on Polyhydric Alcohols.

was obtained was not prepared according to the official directions, but the quinine was dissolved in the tincture of orange by the aid of a small quantity of acid. It was white and soluble in water; on examination it proved to be sulphate of calcium.

Mr. Hustwick has shown (*Pharm. Journ.*, [3], iii., p. 722), that this deposit is formed during three days used in its preparation by the pharmacopœial method, and that another deposit is formed subsequently at low temperatures, consisting of tannate of quinine. I have not been able to obtain any of this latter deposit.

Tinctura Rhei.—The deposit, which was of a greyish-brown color, was washed with proof-spirit as before, until the washings ran through only slightly colored, then dried and extracted by benzol, first in the extraction apparatus, and then by boiling. A yellow solution was formed which on evaporation left a residue too small for further purification and was, therefore, weighed as slightly impure chrysophanic acid. 1.485 of a gram yielded .018 of a gram of chrysophanic acid = 1.2 per cent. This residue was shown to consist of chrysophanic acid by yielding a fine rose-colored solution with dilute ammonia, which solution gave a lilac to rose-colored precipitate with acetate of lead.

The remaining portion of the deposit was boiled with water, and, as it still gave evidence of the presence of chrysophanic acid, was boiled with very dilute ammonia until exhausted; the ammoniacal solution filtered, washed, and shaken with chloroform after acidulating with acetic acid. The chloroformic solution was evaporated to dryness and the residue weight .0142 of a gram = .96 per cent. which, with that already obtained, equalled 2.17 per cent. of chrysophanic acid in the deposit.

The residue after the above treatment was now washed with dilute hydrochloric acid, and the solution gave evidence of oxalate of calcium in considerable quantity. Another portion of the deposit, .5634 of a gram, was therefore taken and the ash estimated by ignition, it corresponded to 29 per cent. of the deposit, and consisted chiefly of carbonate of calcium, due to the decomposition of the oxalate, also a small quantity of magnesium, but no potassium. The deposit in *tinct. rhei.* therefore contains 2.17 per cent. of chrysophanic acid and about 37 per cent. of oxalate of calcium. I had not enough of the deposit to test it for cathartic acid, which is the purgative principle of the drug. The remainder, apparently, consisted of gummy matters.

NOTE.—It will be observed that no reference is made to the *amount*

of deposit formed in the above tinctures, I had the opportunity of judging roughly in a few only, viz:—Tinct. cinchonæ, $\frac{1}{4}$ oz. from 1. gallon; do., 3j. from 1 gallon; tr. calumbæ, 3iss. from 1 gallon. I should be glad to receive any deposit, especially those from the more potent tinctures, for further examination.—*Phar. Jour. and Trans.*, Dec. 22, 1883.

HIPPURATE OF SODA.

BY PETER BOA.

Read at a meeting of the North British Branch of the Pharmaceutical Society, December 19, 1883.

At our last meeting there was exhibited a specimen of hippurate of soda. This salt is perhaps deserving of more than the incidental notice which it then received, on account of the recent suggestion of Dr. Garrod to employ the alkaline hippurates in diseases arising from excess of uric acid in the system. In the course of his experiments he made the observation that hippuric acid, when allowed to remain in contact with uric acid, caused the disappearance of the latter.

It may be noted that there are three forms in which nitrogenized waste is eliminated from the system by the kidneys, viz.: as urea, uric acid and hippuric acid. Of these uric acid is the least soluble. It is practically insoluble in water, and the salts which it forms are but slightly soluble. On account of this characteristic it is, although forming only a very small part of the excreted waste, frequently the cause of disease, owing to its liability to form concretion in the kidneys, giving rise to gravel and calculus, and in the form of urate of sodium it may deposit in certain tissues, and give rise to gouty and rheumatic symptoms.

In herbivorous animals the renal excretions rarely contain uric acid, but hippuric acid is always present. Uric acid is probably formed at one stage, but the presence of hippuric acid in considerable quantity effects its decomposition. Hippuric acid forms salts which are extremely soluble.

To approximate, therefore, the excretions from the kidneys of man to those of the herbivora, is to make an important step towards the prevention or removal, as the case may be, of the cause of diseases which arise from the defective elimination of uric acid. This may be attained by the employment of such a salt as hippurate of soda.

Dr. Garrod says: "There is no doubt that if hippurate of soda be added to a blood serum which shows the presence of a urate, the latter is soon removed from it."

I make these preliminary remarks merely to show on what grounds the introduction of this remedy is based. In view of the salt coming into general use, I have made a number of experiments in regard to its behavior towards other substances with which it might be administered in combination.

There are only two forms in which we shall likely be called upon to dispense it, namely, in powders and mixtures, and in regard to these only have I made experiments. Avoiding details, I shall summarize the results which seem worth recording.

(1.) *Powders*.—The hippurate of soda itself, dispensed in powder form, keeps quite well in paper. Combinations of the salt with lithia carbonate and citrate and bicarbonate of potash and soda, put up in powders in the usual way and kept for a fortnight, were found on examination to be in as good condition as when prepared.

(2.) *Mixtures*.—Like all alkaline salts, the taste of hippurate of soda is disagreeably saline. I have tried a number of combinations with the object of rendering its administration as pleasant as possible, and the results may be briefly stated.

Chloroform water or spirit of chloroform seems to make it more disagreeable, rendering it almost nauseous.

Infusion of calumba disguises the saline taste, and where the bitter is not an objection, affords an eligible vehicle.

The most agreeable mixtures, however, are obtained by employing syrup and peppermint water, or glycerin and cinnamon water.

The following examples may suffice:

- | | |
|-------------------------------------|----------|
| (1.) R Sodæ hippurat. | gr. 80 |
| Lithiæ carb. | gr. 24 |
| Glycerin. | ℥iv |
| Aq. cinnam. | ad ℥viij |
| M. Sig. One-eighth part for a dose. | |
| (2.) R Sodæ hippur. | ℥ij |
| Potass. citrat. | ℥iij |
| Syrupi | ℥vj |
| Aq. menth. pip. | ad ℥vj |
| M. Sig. Tablespoonful for a dose. | |

The addition of an alkaline carbonate or citrate as given in the

foregoing is desirable, so as to imitate the condition of the renal excretion of the herbivora, which is alkaline, that of man being usually acid.

The salt is very soluble. Fifty grains dissolve in thirty minims of water, forming a syrupy liquid. The dose may be from ten to fifteen grains.—*Phar. Jour. and Trans.*, Dec. 29, 1883.

THE SOLUBILITY OF CALCIC HYDRATE IN WATER AT DIFFERENT TEMPERATURES.

BY THOMAS MABEN.

Read at a Meeting of the North British Branch of the Pharmaceutical Society, December 19, 1883.

In the course of an able paper on "Lime Water; its Preparation, Preservation and Estimation," read some time ago by Mr. Abraham, of Liverpool, and subsequently published,¹ the author stated that he had found a difficulty in maintaining his lime water at the proper strength. On investigating the cause of this he was led to the conclusion that the difference was due to increase of temperature, and he indicated that the solubility of calcic hydrate fell from 0.56 grain CaO per fluidounce at 60°F. to something like 0.5 grain at 70°F.

Having had occasion in July last to give a few notes (which were afterwards published in an extended form²) on the same subject before a local association, I undertook at that time an investigation as to the effect of temperature on solubility, and though my experiments were confirmatory of Mr. Abraham's to a certain extent, the results did not show such a marked difference as his had done. I have recently repeated these experiments with more care than before, and now bring the results before you, in the hope that they may prove of some interest.

I have been much surprised, in looking into various authorities, to find that great differences of opinion prevail regarding the solubility of calcic hydrate. A few of these may be noted. At 15°C. calcic hydrate is held in solution to the extent of 1 part CaO in 781 parts water, according to Squire; 780 (Miller and Bineau); 778 (Dalton); 776 (Paris Codex); 764 (Hager); 750 (United States Pharmacopœia);

¹ "*Pharm. Journal*" [3], xiii, p. 433.

² "*Chemist and Druggist*," 1883, p. 390.

730 (Wittstein); 500 (Ure), and 450 (Davy). At 100°C. 1 part is dissolved in 1,560 water, according to Miller; 1,500 (Bineau); 1,350 (Wittstein); 1,305 (Hager); 1,300 (United States Pharmacopœia), and 1,270 (Dalton).

According to the German Pharmacopœia *aqua calcarix* should contain calcic hydrate equal to from 0.43 to 0.49 gr. CaO per fluidounce; the United States Pharmacopœia gives the amount in solution as about $\frac{1}{2}$ grain, while the British Pharmacopœia requires *liq. calcis* to contain .56 gr., i. e., to be as nearly as possible a saturated solution.

According to Storer, Dalton disputes the correctness of the statements of observers who say that water takes up $\frac{1}{500}$ or $\frac{1}{600}$ its weight of lime, the fact being, he says, that few have tried the experiment with due care.

In estimating the strength of solutions of calcic hydrate it is of the utmost importance that we should ascertain correctly the temperature at which the solutions pass through the filter. This is a matter of considerable difficulty. I have found that different methods give quite different results, and there is not the slightest doubt, in my opinion, that had the authorities quoted carefully followed an uniform system their results would have been much more in accord than they are. It is sufficiently obvious that out of the eight or nine different solubilities quoted not more than one can be absolutely correct, and while the question is not one of crucial importance it would be extremely interesting if by some means or another the real figure could be arrived at.

In the experiments which form the basis of this communication I adopted the following method, it having been found to give the most constant results.

For the lowest temperature I placed a glass beaker containing calcic hydrate and distilled water in a freezing mixture till the thermometer fell to 0°C., and ice began to form. The liquid was then filtered, zero being maintained by placing the funnel also in a freezing mixture. The temperatures from 5°C. to 15°C. present no special difficulty, as they are easily obtained by adding hot or cold water to the beaker till the required point is reached and filtering in the usual way. Comparatively little variation takes place when the surrounding atmosphere indicates from 10°C. to 12°C. From 15°C. to 80°C. I made use of the water-bath. A flask containing lime and water was placed in the bath, and as soon as the contents reached the required temperature, the mixture was filtered through a funnel placed in the ordinary funnel

space in the bath. The water surrounding the funnel, being always at the same temperature as that surrounding the flask, it was hardly possible for any variation to take place, but in order to insure accuracy the thermometer was used in the funnel as well as in the flask. For the temperatures above 80°C . the solutions were heated over the naked flame and passed through a funnel kept in boiling water. It is exceedingly difficult, unless with special appliances, to filter at the boiling point, and I had to be content with what I have described. Strictly speaking, the maximum point reached would be from 98° to 99°C .

For the sake of convenience, quantities by volume were taken, a small graduated flask being employed as a measure.

The amount of lime in solution was ascertained volumetrically, decinormal nitric acid being used. This acid is preferable to oxalic, as calcic nitrate being soluble in water there is no danger of the exact point of neutrality being obscured by the presence of a precipitate.

Calcic oxide, perfectly free from all impurities, was made use of, after having been slaked with distilled water. Incidentally, I may remark that the heat generated in "slaking" the lime rose to the very high point of 205°C .

The results which were arrived at have been tabulated in three ways for the sake of convenience, and are appended. The figures are in each case calculated from the mean of three titrations, but where thought necessary corroborative results have been obtained by additional experiments.

It will be observed that the solubilities are expressed in terms of calcic oxide. I express them so, in accordance with custom, although it is apparent that the calcium exists in solution as hydrate and not as oxide.

I am unwilling to close this note without a few words as to its practical bearing upon the *liquor calcis* of the British Pharmacopœia. Repeated proceedings have been instituted against druggists for the sale of defective lime water, and cases have been reported where the strength was as low as 0.1, 0.2 and 0.3 gr. CaO per fluidounce. Several hypotheses might be started to account for this state of things, and I shall briefly allude to one or two of these.

In the first place, it is obvious that the variations of temperature which naturally occur really exercise comparatively little influence on the strength of lime water, for it can rarely happen that the tempera-

ture of a shop will rise above 32°C . (90°F .), and yet at that point water holds in solution about 0.5 gr. CaO per fluidounce.

Neither can we account for these faulty waters on the hypothesis that undistilled water had been used in their preparation, unless, indeed, the water had been altogether exceptional in permanent hardness. I have found that a water containing about 10 grains of total solids per gallon gives lime water of full strength. At the same time this does not alter the fact that only distilled water should be employed in preparing *liquor calcis*.

Other two hypotheses remain, either of which would furnish a sufficient cause for even the weakest lime water. One is that the calcic hydrate, not having been properly stored, had almost entirely changed its constitution and become carbonate; the other, that the solution, after decantation or filtration, had been so badly kept that the lime originally present had all or nearly all been precipitated. It is a well-known fact, and one which is daily made use of by the agriculturist in the application of lime to the soil, that if burnt lime be exposed to the atmosphere, even for a very short time, it passes over into the milder form of carbonate. The same reaction, of course, takes place on the shop shelves, and if slaked lime is not kept in an air-tight vessel, it necessarily follows that it will deteriorate, owing to the absorption of CO_2 . If, forgetting this, any pharmacist has been careless in storing the slaked lime, it need not be wondered at if his lime water is weak.

I have found that lime water can be made of full strength with calcic hydrate, mixed with 15 per cent. of carbonate; with equal parts of hydrate and carbonate I obtained 0.5 gr. CaO per fluidounce; with 25 per cent. hydrate and 75 carbonate, 0.4 gr.; and with 10 per cent. hydrate and 90 carbonate, the amount dissolved was only 0.1 grain.

It is stated in almost every text-book that calcic carbonate is insoluble in water, and if this is so these results are, to say the least, very singular. I have been able, however, to find several authorities who differ from the popular belief. Among others, Thorpe¹ states that a litre of water dissolves 0.1 gram CaCO_3 , that is in the proportion of 10,000 to 1. My own experiments go to prove that 40,000 to 1 is nearer the mark, but whatever the solubility is it is quite appreciable, and the alkalinity can readily be estimated.

¹ "Inorganic Chemistry," vol. 1, p. 107.

The U. S. Pharmacopœia states that "the alkaline reaction of the liquid entirely disappears after it has been saturated with carbonic acid gas, and the excess of the latter has been expelled by boiling (abs. of alkalies or their carbonates)." This, however, is not so; the liquid after boiling is still alkaline, though of course not to any large extent, and the test as it stands is therefore worthless.

The other hypothesis is similar in principle to that just explained. If after filtration the lime water is kept in vessels of too large a capacity, or in unstoppered bottles, calcic carbonate is rapidly deposited. Even when most carefully preserved, this takes place to a certain extent, the coating of carbonate inside the shop bottles being a familiar sight to all of us. This is of itself quite sufficient to account for occasional inferior specimens, and it will be remembered was the defence urged at a recent trial; but if there is reason to suspect that the lime water is habitually weak, the explanation would probably be found in the fact that the stock of lime was for the most part in the form of carbonate.

It is difficult to understand why the presence of carbonate should prevent the solution of the hydrate when the latter is present in sufficient quantity to saturate the water, but I have repeatedly proved that it does so, whatever be the explanation of the fact.

Solubility of Calcic Hydrate at Different Temperatures.

Temperature. Deg's C.	Expressed in grains CaO per fluid- ounce.	Expressed as 1 part CaO in parts water.	Expressed as parts CaO in 100 parts water.	Temperature. Deg's C.	Expressed in grains CaO per fluid- ounce.	Expressed as 1 part CaO in parts water.	Expressed as parts CaO in 100 parts water.
0	•576	750	•131	55	•396	1,104	•09
5	•572	764	•130	60	•385	1,136	•088
10	•568	770	•129	65	•362	1,208	•082
15	•561	779	•128	70	•354	1,235	•08
20	•553	791	•126	75	•333	1,313	•076
25	•526	831	•120	80	•321	1,362	•073
30	•507	862	•116	85	•315	1,388	•072
35	•481	909	•109	90	•277	1,579	•063
40	•460	932	•107	95	•265	1,650	•06
45	•444	985	•101	99	•265	1,650	•06
50	•429	1,019	•098				

ACTION OF CERTAIN VEGETABLE ACIDS ON LEAD AND TIN.

BY F. P. HALL.

Taking into consideration the large quantities of tinned food which are constantly being consumed, the author has thought it expedient to study the action of various organic acids on the materials which are exposed in the interior of the cans, viz., tin and lead. The present paper contains the results of experiments on this subject, and also investigations on the quality of tin plate and tin foil used as covers for food products.

The first series of experiments were conducted to determine quantitatively the action of the more common vegetable acids on the metals in question, all previous quantitative work in this direction having been made with acetic acid only. First of all, in order to test the effect of alloying on the corrosion of the metals, the amount of tin dissolved, when pure, was compared with the amount dissolved under the same conditions from an alloy exposing the same surface of the metals in question. This was effected by proportioning the size of the plates of pure metals according to the composition of the alloy. Three alloys were made, taking into consideration the specific gravities of the metals, one with equal parts of each metal, one with excess of tin, and one with excess of lead. The metals were fused, well mixed together, cast into thin sheets in iron moulds, rolled into thin strips, and cut into pieces $\frac{1}{2}$ inch wide and 12 inches long, thus exposing one-fifth of a square foot surface. The tin and lead strips were of the same width, but varied in length for the reason stated above. The acetic acid solution employed contained 5.75 per cent. of acid, the solutions of tartaric and citric acids were made to an equal degree of acidity. After an exposure of two weeks to the action of the acids at 25° – 35° , all the metals were found to be tarnished more or less, the tin more so than the lead; two of the alloys were sprinkled with small black crystals of lead; the smallest pieces of lead in tartaric acid were covered with transparent crystals of lead tartrate. The solutions containing tin were yellowish, whilst those with lead were clear and colorless. The pieces of tin were covered with a dusty powder. The strips of metals were taken out, washed, dried, and weighed. The solutions were precipitated with hydrogen sulphide.

Surface exposed in sq. inches.	Per cent. composition.		Acetic Acid.				Tartaric Acid.				Citric Acid.			
	Lead	Tin.	Percentage of dissolved metals.		Total amount dissolved (in grams) from	Percentage of dissolved metals.	Total amount dissolved (in grams) from	Percentage of disso ved meta	Total amount dissolved (in grams) from	Lead.	Tin.	Alloys.	Pure metals.	
			Lead.	Tin.										
7-2 7-2	100-0 34-1	65-9 100-0	} 11-54	88-46	0-3744	0-7122	9-73	90-27	0-0268	0-0664	10-15	89-85	0-1626	0-4785
14-4 14-4	100-0 60-8	39-2 100-0		} 13-57	86-42	0-4110	0-8242	11-23	88-77	0-0374	0-0750	13-42	86-58	0-1565	0-5439
21-6 21-6	100-0 80-84	19-16 100-0	} 75-46		24-54	0-6476	0-8073	22-02	77-08	0-0349	0-0787	44-58	55-42	0-2203	0-5946
7-2	34-1	65-9		15-25	84-74	0-0341	0-1332	17-05	82-35	0-0102	0-0400	6-74	93-25	0-0267	0-0644

The lead gave dense black precipitates, finer in the tartaric and citric acids than in the acetic. The tin came down brown in acetic, and yellow and flocculent in the tartaric and citric acids. With the alloys, the precipitates were dark-brown in acetic and light-colored and flocculent in the other acids. The results are given in the above table.

Some similar experiments were now conducted in stoppered bottles. In order to exclude air as much as possible, the bottles were heated, filled with acid while hot; boiled; and at once tightly stoppered. The results are given in the last line of the above table. Another series of experiments proved conclusively that galvanic action did not influence the rapidity of the corrosion, the action generally being slight at first, and increasing as time went on. Dilute acids, if in sufficient quantities, cause more corrosion than stronger ones. Some experiments were next tried on the tins themselves. 200 cc. of the acids were put into three empty tins, tied over with paper, and examined after two weeks. The citric and tartaric acids had removed the tinning. A white powder was deposited in the citric acid solution soluble in hydrochloric acid. The quantities of lead and tin dissolved were as follows:

Metals.	Grams dissolved by		
	Acetic acid.	Tartaric acid.	Citric acid.
Lead.....	0.0117	0.0873	0.1559
Tin.....	0.4178	1.0430	0.6828

In addition to these metals, there was a good deal of iron dissolved. The lead was derived from the solder.

The result of the analysis of various samples of tin plate showed that the superior class or "Bright plate" was tinned with pure tin, and that this quality is the one almost universally used for tinware; the inferior class, or "Terne plate," as is understood, contains lead to the extent of 70 per cent.; it is considerably duller than bright plate, and is used almost exclusively for roofing purposes. The analysis of commercial tin foil proves it to be of a very mixed character, from pure tin to stuff containing 90 per cent. of lead; the latter would prove deleterious if used for cheese or like substances.—*Jour. Chem. Soc.*, Nov. 1883, p. 1038; *Chem. News*, xlvii, 290, 300.

CÆRULIGNOL: REICHENBACH'S OXIDIZING PRINCIPLE.

BY P. PASTROVICH.

The high-boiling portions of beech-tar oil are characterized by the splendid blue color which they give with chloride of lime, or in alcoholic solution with baryta-water. The separation of the body to which this color is due—called by Reichenbach the “oxidizing principle”—from the other constituents of the tar-oil, is very difficult, but is best effected by boiling the oil for some time with the weakest acetic acid capable of dissolving it, and pouring the resulting solution into a large quantity of water, whereby the oil is separated, while a nitrogenous body remains in solution. The “blue oil,” or Cærulignol, thus purified, distils between 240° and 241° ; it is nearly colorless, has a not unpleasant creosote-like odor and burning aromatic taste; sp. gr. = 1.05645 at 15° . It dissolves very sparingly in cold, more readily in hot water, and in almost any quantity in alcohol, ether, and acetic acid, forming neutral solutions. It is colored red by strong sulphuric acid, and when mixed with potash-lye, becomes dark colored on exposure to the air. With chloride of lime, and in alcoholic solution with baryta-water, it produces the splendid blue color already mentioned. Its alcoholic solution is colored green by alcoholic ferric chloride; its aqueous solution gives a fine tarmine color with aqueous ferric chloride.

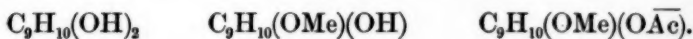
Cærulignol gives by analysis numbers leading to the formula $C_{10}H_{14}O_2$, which is confirmed by the vapor-density (5.69 – 5.84 by V. Meyer's method; 5.76 by calculation). By prolonged heating in sealed tubes at 140° with excess of strong hydrochloric acid, it is resolved into methyl chloride and a body which when purified by repeated crystallization from water and finally from benzene, is found to have the composition $C_9H_{12}O_2$,—its formation, represented by the equation $C_{10}H_{14}O_3 + HCl = CH_3Cl + C_9H_{12}O_2$, being exactly analogous to that of the compound $C_9H_{12}O_3$ from methylic propylpyrogallate. The solution of this body is colored green by ferric chloride, and when mixed with alkalis, gradually acquires a darker color in contact with the air.

Acetocærulignol, $C_{12}H_{16}O_3 = C_{10}H_{13}\overline{Ac}O_2$, formed by boiling cærulignol (3 parts) for two days with one part of acetic anhydride, was once obtained in fan-shaped groups of crystals, but mostly as a viscid nearly

colorless oil, insoluble in water, freely soluble in alcohol, ether, and acetic acid, boiling with partial decomposition near 265°.

Nitrocœrulignol, $C_{10}H_{13}(NO)_2O_2$, formed by treating cœrulignol with nitric acid of sp. gr. 1.2, separates from water or alcohol in honey-yellow crystals, resembling those of picric acid, and melting at 124°.

The decomposition of cœrulignol by hydrochloric acid, and the formation of its acetyl-derivative, show that it contains the groups OCH_3 and OH , and that it may accordingly be regarded as the methyl-ether of a higher homologue of one of the three dihydroxybenzenes, the compound $C_9H_{12}O_3$ formed from it by the action of hydrochloric acid being this higher homologue itself, which, together with cœrulignol and its acetyl-derivative, may be represented by the formulæ—



To determine from which of the three dihydroxybenzenes cœrulignol is derived, a small quantity of each of these compounds was heated at 135° with a drop of nitro-benzene and a drop of strong sulphuric acid, the melt then dissolved in water, and the solution made slightly alkaline,—whereupon resorcinol gave a bright red solution with yellow fluorescence, catechol a blue-violet, and quinol a yellow liquid. Now cœrulignol treated in like manner gave a reaction exactly like that of catechol, and may therefore perhaps be regarded as a homologue of guaiacol (methyl-catechol); but whether it contains a propyl-group or some other groups, must for the present remain undecided.—*Jour. Chem. Soc.*, November, 1883; *Monatsh. Chem.*, iv, 188.

Vinum Aloes.—Having a prescription, containing wine of aloes, to put up, and there being none in store, I devised the following formula for its extemporaneous preparation:

Aqueous extract of aloes.....	$\frac{1}{2}$ oz, av.
Tincture of cardamom.....	fl 3v.
Tincture of ginger.....	fl 3ss.
White wine enough to make.....	Oss.

Dissolve the extract in the wine and add the tinctures.

The tinctures bring the alcoholic strength of the wine to that of the stronger white wine. This makes a clear solution and is up to the required strength of U. S. P.

Maybe this is worthy of a place in the Journal. E. G. EBERLE.

VARIETIES.

EFFECT OF ALUM GARGLES UPON THE TEETH.—M. Young ("Courier Med."), prescribed a gargle containing a small proportion of alum for a woman suffering from chronic pharyngitis with catarrh of the middle ear. The patient, finding relief, continued its use for some three weeks. But perceiving that, at meals, her teeth began to crumble into little pieces, she consulted her dentist, who considered it due to the alum gargle, as when the enamel is removed from the teeth the alum breaks down the dentine. To prevent this it is best, immediately after using an alum gargle, to wash the mouth out with a solution of bicarbonate of soda or an alkaline water. —*Med. and Surg. Reporter.*

MINERAL WATERS.—When one day there comes to be written, from the standpoint of modern science, a history of human superstition, those chapters of the work which deal with belief in the various virtues from time to time accredited to waters, either of miraculous or of natural origin, will assuredly not be either the shortest or the least interesting. No one who has visited one of the springs which occur in almost every rocky range from the Grampian to the Pyrenees, and which a ready faith invests with supernatural curative power, can see much reason to expect that such belief will suffer measurable diminution for many generations. With the mineral spring proper the case is different; and while it seems long to look back to the time when the temples to Esculapius were erected near to such sources, and while it is true that even to-day much mysticism is allowed to surround the subject, the chemist of the age is in a position to assert that the curative action of any given mineral water is a result of the combined therapeutic action of the sum of its constituents.—*Medical Press; Louisiv. Med. News.*

NITRITE OF SODIUM.—Drs. Ringer and Murrell have concluded that the ordinarily prescribed dose (20 grs.) is dangerously large. From some observations of Dr. A. H. Baines, in the *Lancet*, December 1, 1883, it seems that this drug is often adulterated with nitrate of sodium, and from this fact has arisen the supposed necessity for such large doses. If we can procure the pure drug, and we ought to do so if we use it at all, two or three grains will be the dose. Dr. Baines reports a case of petit mal in which its use was very beneficial.—*Med. and Surg. Rep.*, Jan. 19, 1884.

CORROSIVE SUBLIMATE IN GONORRHOEA.—Dr. Joseph McChesney, of Deming, New Mexico, contributes to the *Therapeutic Gazette*, for December, a report of a series of seven cases of gonorrhœa in which he employed by way of treatment only a solution of corrosive sublimate, one grain to six ounces of water. The results are already very surprising. In several of these cases this injection was resorted to after a long and unsuccessful course with the ordinary remedies in such cases, and the result was uniform success. He resorts to these injections, which he gives once every four hours, after the subsidence of the acute stage. He is very confident that,

properly applied, this solution will effect a cure of the gonorrhoea within from eight to ten days after it has been resorted to.

USE OF MILK SUGAR.—Dr. V. Poulain believes that the reason that cow's milk so often disagrees with children is to be found in the fact that cane sugar is used to sweeten it. In the *British Med. Jour.*, June 30, 1883, he says that for thirty-three years he has used the sugar of milk with the best results.—*New Eng. Med. Monthly*, January, 1884, p. 190.

PARALDEHYDE — ACETAL — CANNABINUM TANNICUM.—Dr. Eickholt contributes an article on these drugs to the *Deutsche Med. Woch.*, December 5, 1883. The two first he does not like, considering them uncertain as hypnotics, and that they possess injurious properties (such as deranging digestion, producing nausea, and the like), that more than counterbalance their virtues. Cannabinum tannicum (derived from Indian hemp), in doses of $\frac{1}{2}$ to 1 grain, he considers especially useful in neurasthenic insomnia, and in mild melancholia without delusions, but not in excitable conditions. It does not derange digestion.—*Med. and Surg. Rep.*, Jan. 19, 1884.

ARTIFICIAL UREA AS A SUBSTITUTE FOR QUININE.—The *Jour. d'Hygiène* reports that Dr. Belvoustoff, of Charkow, Russia, has used artificial urea (carbamide) as a remedy for intermittent fever in place of quinine. It is almost tasteless, and does not depress the nervous system. In Southern Russia, the peasants have used urine as a febrifuge for centuries; this has suggested the rational use of urea.—*Med. and Surg. Rep.*, Jan. 12, 1884.

SALICYLAGE.—This is the term applied to the practice resorted to in Paris of using salicylic acid as a preservative of food and drinks. The question of its injurious effects was recently referred by the government to Prof. Brouardel, who reports as follows: 1. The daily use of even the smallest dose of salicylic acid is unsafe, its innocuity not having been as yet demonstrated. 2. It is certainly dangerous for the subjects of lesions of the kidneys or of the liver from old age or by some degenerative process. 3. The prohibition of salicylage should be strictly maintained.—*Med. and Surg. Rep.*, Jan. 19, 1884.

PILOCARPINE.—Dr. James Murphy considers the use of pilocarpine, on account of its diuretic and diaphoretic properties, a valuable adjuvant in the treatment of puerperal eclampsia, as it reduces arterial tension at once, and gives our other remedies time to act. He reports two cases, in which it acted very favorably, in the "*Am. Jour. Obstetrics*," Dec., 1883. He used it hypodermically in doses of $\frac{1}{2}$ of a grain.—*Med. and Surg. Rep.*, Jan. 12.

VERBASCUM THAPSUS.—Dr. F. J. B. Quinlan ("*Brit. Med. Jour.*," Dec. 8, 1883) reports a case of pre-tubercular phthisis in which the patient gained twelve pounds in weight in one month under the use of mullein. He considers that it possesses all the advantages and none of the drawbacks of cod liver oil. (See also "*Amer. Jour. Phar.*," 1883, pp. 267 and 580.)

CONVALLARIA MAJALIS.—Dr. W. S. Gottheil, House Physician of Charity Hospital, New York, contributes to the "Therapeutic Gazette" for January, 1884, a detailed account of his use of *convallaria majalis* in fifteen cases, comprising organic heart disease, cardiac failure in acute rheumatism, hemorrhages or phthisis, and one case of Bright's disease. The results would seem to justify a thorough trial at the hands of the profession of this proposed substitute for digitalis. It possesses the very important negative property of producing no cumulative effect, a desideratum which has been long felt by the profession.

EXAMINATION OF FATS. By K. Zulkowsky.—Gröger's modification ("Dingl. polyt. J.," 1882 [244], 303, and [246], 286) of Haussmann's method (*ibid.* [240], 62) of testing fats depends on the fact that fatty acids are at once saponified by alcoholic potash, whereas neutral fats are only saponified on boiling.

Phenolphthaleïn is added to an alcoholic solution of the fat, and standard alcoholic potash dropped in until the red coloration disappears. Excess of standard potash is then added, the mixture boiled for half an hour, and the excess of alkali determined volumetrically. In this way the amount of fatty acids and of neutral fats is ascertained.

The author points out that the quantity of fat saponified by a litre of the normal alkali gives a clue to the nature of the fat, and would for example distinguish between artificial and natural butter.

The amount of glycerol in fats can be estimated in this way, each cc. of normal alkali required to saponify the neutral fat corresponding with 0.030667 gram of glycerol.

If the fat is dry and pure, then the weight of neutral fat $F - G$ [$G = (0.012667v)$] = the amount of fatty acids, when v = the cc. of standard potash used.

The molecular weight of the fatty acid can also be ascertained.—*Jour. Chem. Soc.*, Oct., 1883; *Ber.*, 16, 1140.

FETID AND SWEATING FEET.—Dr. A. M. Vail ("Jour. Am. Med. Ass.," Nov. 3, 1883) says that he has never known the following to fail:

R	Aluminii et ammon sulph. exsic.....	grs. 2
	Acidi boracici.....	grs. 2
	Aquæ rosæ.....	grs. 35

M. Sig.—Apply with soft sponge without rubbing, just as soon as the shoes and stockings are removed, while the feet are yet moist. This is quite necessary, as also the care not to rub.

Let this be repeated every two or three days, in the evening.

DISTILLATION OF WINE. By S. Kiticsan.—The author having repeated Liebermann's experiments ("Ber." [15], 154, 438, 2554) on the distillation of wine, finds that the distillate contains ammonia and formic acid, and that the precipitate produced on addition of silver nitrate contains organic silver salts; Wartha's method ("Ber." [15], 437) for detecting sulphurous acid in wines is therefore untrustworthy. Old wines contain from 0.0057—0.034 per cent. of ammonia.—*Jour. Chem. Soc.*, Oct., 1883; *Ber.*, 16, 1189.

MINUTES OF THE COLLEGE.

PHILADELPHIA, December 31, 1883.

A stated meeting of the Philadelphia College of Pharmacy was held on the 31st day of December, at the College Hall, No. 145 North Tenth street. Dillwyn Parrish, President, in the chair. Sixteen members in attendance.

The minutes of the semi-annual meeting were read, and, on motion, adopted.

Thomas S. Wiegand, in the absence of the Secretary of the Board of Trustees, read the minutes of the Board since the semi-annual meeting of College in September last, which were, on motion, adopted.

Wm. B. Thompson referred to the matter of preliminary education, which had, at the last meeting of the College, been referred to the Board of Trustees for their consideration, and after discussing the subject, hoped the matter would not be passed over without a full consideration of its merits.

Mr. Blair was of the opinion that students should not be admitted to the Junior Class until they could pass an examination before a committee appointed for the purpose, and not before they had been in the drug business at least two years.

Prof. Maisch took a different view of the matter in relation to excluding students from the lectures until they had served at the business for two years, preferring that a rigid junior examination be held as at present, before admission to the Senior Course.

Mr. Bullock stated that the Committee of Instruction, to whom the matter had been referred by the Board of Trustees, had found much difficulty in ascertaining the views of members on the subject, and hoped that some plan would be adopted for that purpose.

Professor Sadtler suggested that the advocates of the various phases of the question, present their arguments *pro* and *con* in answer to queries, which might be sent out to the members by the Committee of Instruction appointed by the Board of Trustees, and in furtherance of his views offered the following resolution, which was, on motion, adopted.

"*Resolved*, That the College requests the Board of Trustees, through its Committee on Instruction, to prepare and send to all the active members of the College a set of queries as to the desirableness of a preliminary examination on the part of students desiring to enter the College; as to what this preliminary examination should cover, and as to how it should be conducted, and on other matters connected with this subject."

Professor Maisch announced the death of John Eliot Howard, of Tottenham, England, an honorary member of this College, and alluded in fitting terms to his great services as a guinologist. An obituary notice of him will be found in the January number of this Journal for 1884, page 57.

Charles Bullock, on behalf of the Committee on Deceased Members, announced the death of Samuel W. James, an active member of the College, which event occurred about two months ago. Mr. James was a zealous member of the College many years ago, when its building was in Zane street, acting as librarian, and otherwise serving its interests. He resided in Bustleton, Philadelphia county.

Then, on motion, adjourned.

WILLIAM J. JENKS, *Secretary*.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, January 15, 1884.

In the absence of the President, Dr. A. W. Miller was called to the chair. The minutes of the last meeting were read and approved.

Professor Maisch presented to the cabinet two samples of *Cotton seeds*, sent by Mr. Hiland Flowers, of Louisiana; the varieties are known as golden prolific, and silk cotton. Also a specimen of the bark of *Eucalyptus globulus*, which was sent to him some time ago by Mr. J. J. Brown, of California; the specimen is very interesting, as there is evidently a disease which causes a secretion of kino-like substance. Likewise a root called *Cinnamon root*, which is used in Europe for the purpose of adulterating powdered cinnamon; the root has a flavor of cinnamon and cloves. This called out a statement from the Chairman that *Clove stems*, when reduced to powder, are used to mix with powdered cloves, and that in our neighboring city of Camden there was a factory for roasting and grinding coconut shells, which material is used for adulterating spices, and as it sells at 2½ cents per pound, it enables the fraudulent operator to dilute the spices with large profits.

Mr. J. W. England read a paper upon "*Medicated Waters*;" the reading of the paper brought out a discussion upon the varieties of oil of neroli, and it was said that while oil of petit grain is sometimes used, the true oil of neroli was obtained from the flowers, the best being known as *pétale bigarade*, and obtained from the flowers of the bitter orange, while that designated as *portugal* is made from the flowers of sweet orange, and is less fragrant.

Mr. H. C. C. Maisch read a short and interesting paper upon the "Stearten of *Oil of Patchouly*."

Upon motion of Mr. Pile, the papers read were referred to the Publication Committee.

Professor Maisch read for Mr. G. W. Kennedy, a paper upon "*Oil of Sweet Birch*." The paper was particularly interesting, as it was accompanied with specimens of all the products of the different stages of the process.

Mr. Gustavus Pile read a paper upon the "Percentage and Specific Gravity of *Alcohol*."

Professor Maisch expressed his gratification at the labor which Mr. Pile had taken in the preparation of the tables submitted with his paper; it was, on motion of Mr. Newbold, referred to the Publication Committee.

Mr. H. C. C. Maisch read a paper upon the "*Action of Ammonium Chloride upon Lead Iodide*." The reaction was exhibited in the presence of the meeting, and it showed the error of the Pharmacopœia in stating that a colorless solution instead of a white magma would be the result. It was moved by Mr. England that the paper read be referred to the Publication Committee.

Dr. Miller read a paper from Prof. J. T. Rothrock giving some observations made with the microscope by students in the University of Pennsylvania, under the direction of Prof. Rothrock. The paper was accompanied by drawings, and will be published in the next number of the Journal.

It was moved that the thanks of the meeting be returned to the authors of the various papers, and that the Secretary record such a resolution.

On motion, adjourned.

THOS. S. WIEGAND, *Registrar*.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

CALIFORNIA PHARMACEUTICAL SOCIETY.—The regular quarterly meeting was held at the College Hall, Dec. 13th, President King in the chair. The meeting was well attended. Five new members were elected.

Papers were read by Messrs. McDonnell, Sommer, Barbet and Keil.

Mr. Runyon exhibited Dr. Squibb's apparatus stand, also Berry's pressure percolator, and a Franciscus gelatin pill-coating machine, which had been presented to the College. Mr. Lengfeld exhibited several rare chemicals and drugs. Mr. Searby exhibited the seeds of *Rheum Palmatum*, obtained from St. Petersburg, in Russia, specimens of which he had given to parties with a view to determine the most favorable locality for their cultivation. He also read to the members a letter received from Mr. J. W. Colcord, of Lynn, Mass., Secretary National Retail Druggists' Association, which contained many good suggestions, heartily endorsed by the members.

Mr. Lengfeld gave notice that at the next meeting he would propose some alteration and amendment to the constitution and by-laws, relative to having monthly meetings instead of the quarterly.

The meeting adjourned at 10.40 P.M.

EDITORIAL DEPARTMENT.

THE SOLUBILITY OF ESSENTIAL OILS IN WATER.—Mr. England's paper on Medicated Waters, which is published in the present number, raises again the question as to the best means for rendering volatile oils soluble in water, or rather for completely saturating water with volatile oils, without introducing objectionable chemicals into the solution. It is well known that these principles are but sparingly soluble, and that they differ in their solubility, those consisting entirely or mainly of hydrocarbons being, as a rule, less soluble than those consisting of oxygenated compounds. Yet the solubility in water has been accurately determined in very few, if any, instances. But it is known that if the volatile oils be finely divided before they are brought in contact with water, they will, like sparingly soluble salts, saturate the menstruum in a shorter time than if added in bulk, the criterion in this case being the odor and taste.

The division is sometimes effected by dissolving the volatile oil in a small quantity of alcohol and adding this solution gradually and with continued shaking to the requisite quantity of water; and where the small amount of alcohol thus introduced is not objectionable, this process is a useful and expeditious one; but the water is usually more or less opalescent or milky and cannot be obtained clear by filtration through paper, owing

to finely divided oil held in suspension. Clear and transparent medicated waters are at once obtained, if the volatile oils be first triturated with a somewhat absorbent powder before the water is added.

Most of the substances which have been recommended for this purpose are mentioned in Mr. England's paper, where also their value for this purpose is discussed. No doubt, calcium phosphate is a better material for this purpose than magnesia or magnesium carbonate, owing to the insolubility of the former salt in water, and the slow action upon it of large quantities of cold or even hot water. But it seems to us that a process which was recommended ten years ago (*Amer. Jour. Phar.*, 1873, p. 564) has not received the attention it deserves, namely, the so-called "hot-water process." Mr. G. C. Percival, of Waterville, Me., showed that volatile oils dissolve in hot water to a much larger extent than in cold water, the excess separating again on cooling and removable in the usual manner. This process was subsequently recommended by E. Plummer, T. Everhart, and W. W. Trout (*Ibid.*, 1875, p. 342, 1877, p. 4), and will doubtless be found serviceable in many cases. But since the composition and solubility of volatile oils differ considerably, it is more than probable that one and the same process may not yield equally satisfactory results with all volatile oils.

This belief is strengthened by a communication received from a correspondent in New Zealand who desires from our contributors information as to the best method for rendering soluble such essential oils as peppermint, cloves, anise, sassafras, gaultheria, etc., and who further states that he has succeeded with oil of lemon and of ginger by using chloride of calcium and phosphate of sodium, but that the same process is not successful with the essential oils enumerated before. Our correspondent does not give the *modus operandi* for preparing the solution; but a glance at the volatile oils mentioned will show that the different behavior is most likely due to difference in composition. We invite our readers who have experience with one or more of these volatile oils to communicate their experience to the JOURNAL.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Year Book of Pharmacy, comprising abstracts of papers relating to Pharmacy, Materia Medica and Chemistry, contributed to British and foreign journals, from July 1, 1882 to June 30, 1883, with the Transactions of the British Pharmaceutical Conference at the twentieth annual meeting, held at Southport, September, 1883. London: J. and A. Churchill. 8vo, pp. 614.

This valuable publication has promptly made its appearance considerably in advance of the similar preparation issued in this country. As usual the abstracts which have been made with accustomed care, are classified under "Chemistry, Materia Medica and Pharmacy," and "Notes and Formulæ." They take up about one-half of the book, the balance being devoted to list of members, minutes of the last meeting of the Conference and the papers read at that meeting. We are pleased to note the prosperous condition of

the Conference, and the interest taken by its members, which is shown by the carefully prepared papers and by the discussions on topics in accord with the objects of the organization.

The Extra Pharmacopœia of Unofficial Drugs and Chemical and Pharmaceutical Preparations. By Wm. Martindale, F.C.S., late Examiner of the Pharmaceutical Society and late Teacher of Pharmacy and Demonstrator of Materia Medica at University College. With references to their use abstracted from the medical journals and a Therapeutic Index of Diseases and Symptoms. By W. Wynn Westcott, M.B. Lond., Deputy Coroner for Central Middlesex. Second Edition. London: H. K. Lewis, 1884. 16mo, pp. 330.

As the title indicates, this little work is intended as a supplement to the British Pharmacopœia. Considering that this standard was published in 1867, and that since that time only a few formulas have been added by the general Council, under whose authority the Pharmacopœia is issued, it is evident that such a supplement must have been very much needed. That such was the case was shown by the exhaustion of the first edition within a few weeks. The second edition now before us is enlarged by the addition of a number of new drugs, chemicals, formulas, and references to therapeutic uses, and of a therapeutic index.

The drugs and chemicals are given in the alphabetical order of their Latin names. In a few cases incorrect old names have been retained, though their recognized correct titles are given as synonyms, and this fact is pointed out in the text. Thus chrysarobin appears in the list as "Acidum chrysophanicum," and butylchloral hydrate as "Crotonchloral hydras." The alkaloid "caffaina" is mentioned a second time as "theine," under its English title like the alkaloid theobromine. Drugs and chemicals recognized by the British Pharmacopœia are introduced only in case new preparations of the same are given. With the exception of these pharmacopœial drugs, all are briefly described by their most prominent characters. Then follow formulas for the various galenical and extemporaneous preparations into which the drug enters, and finally, under the heading of "References," the uses which are made of the same with references to the works or journals where these applications have been described. From the fact that a number of eclectic preparations have been admitted by the author under their commercial incorrect names, though they have been properly characterized as the powdered extractive, etc., it would appear that these remedies are more employed in some parts of Great Britain than they are in some sections of the United States.

It will be seen from the foregoing that the "Extra Pharmacopœia" covers a good deal of ground interesting to the pharmacist and to the physician, and will be useful as a handy work of reference concerning the leading facts, established, or at least reported, of non-pharmacopœial drugs. Such always have been and will continue to be prescribed; but it is to be regretted, that in the place of definite chemicals and of mixtures of known composition, preparations are largely used, which are introduced under a chemical name, but of which little else is known. For this, however, the authors are not responsible, and they have selected of these only a limited

number, and have not withheld the results if unfavorable to the pretended virtues.

We cheerfully recommend the work as a very useful one, and state in conclusion that also a foolscap octavo edition of it is about to appear.

Retail Druggists' Diary and Note-book. Detroit: F. Stearns & Co. 4to.

The Chemists' and Druggists' Diary, 1884. London: 4to.

In addition to the diary, both publications contain much useful and interesting information.

Formulas for Elixirs and other Pharmaceutical Preparations adopted by the Lancaster Pharmaceutical Association. New York: P. W. Bedford. 1884. Pp. 12. (Reprint from the "Pharmaceutical Record.")

The Future Supply of Drugs to the Public. Two addresses. By Professor Attfield, F.R.S.

This pamphlet contains the two scholarly addresses delivered by Professor Attfield as President of the British Pharmaceutical Conference at the meetings of this body held in 1882 and 1883. The special title of the first is "The Relation of Pharmacy to the State," and of the second "The Relation of the State to Pharmacy." We have on a former occasion given a sketch of the author's argumentation, and now merely refer to the publication of the pamphlet containing both addresses.

OBITUARY.

B. FALKENBERG, apothecary, died suddenly on the 25th of September, in New York city, at the age of 71 years. He was born December 31, 1812, at Betzendorf, Salzwedel, from which place he went to Magdeburg, where he learned the drug business. He afterward went to Giessen, where he studied chemistry under Liebig, and in 1846 received the degree of Doctor of Philosophy. After coming to America he, in 1859, established himself as apothecary in Philadelphia, S. E. cor. Ninth and South streets, where he carried on the business until his death.

Mr. Falkenberg was a member of the Philadelphia College of Pharmacy, having joined in 1872; he was highly respected and esteemed by all who were acquainted with him.

We have been informed of the death of the following graduates of the Philadelphia College of Pharmacy:

SAMUEL WALTER COURTNEY, Class 1881, died in Philadelphia, of consumption, Oct. 24th last, in the 24th year of his age.

THOMAS S. COLLINS, M. D., Class 1880, died at Blackwoodstown, N. J., Dec. 12, 1883, of consumption, aged 27 years.

ALONZO G. MACKENSON, Class 1878, died in Philadelphia, Jan. 8, 1884, of meningitis, at the age of 28 years.